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Chicago, December 21, 1929 (*Issued Every Other Week*) Volume XXXII, No. 26

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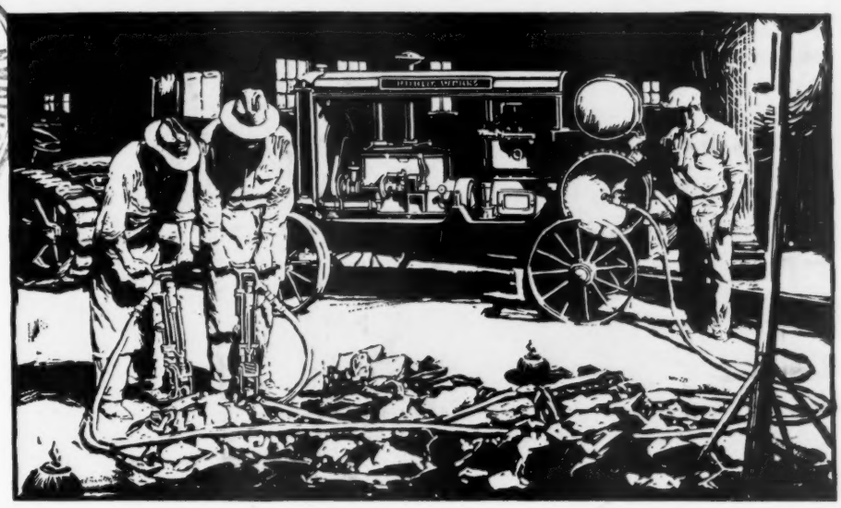

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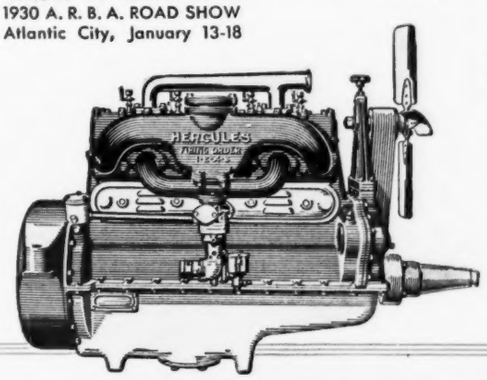

On many types of highway building machinery and road maintenance equipment — shovels and cranes, mixers and pavers, rollers and scrapers, pumps and compressors — Hercules Engines are standard. And the choice of Hercules Power by the manufacturers is endorsed everywhere by the users.

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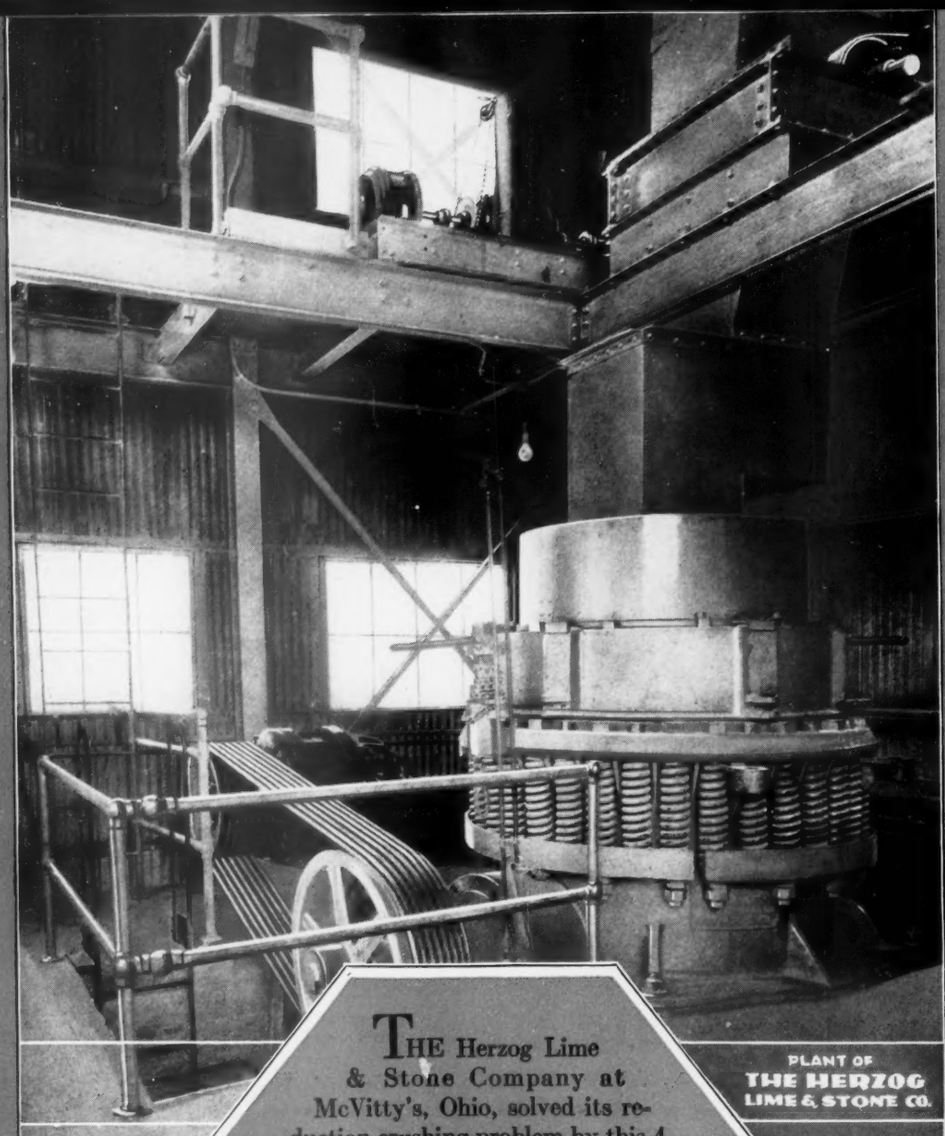
For MODERN CRUSHING PLANTS



PLANT OF
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LIME & STONE CO.

THE Herzog Lime & Stone Company at McVitty's, Ohio, solved its reduction crushing problem by this 4-foot Symons Cone. This modern plant eliminates the expense and trouble involved in the storing of large sizes and permits the production of small sizes in sufficient quantities whenever needed.

This well-built and laid-out plant shows the tendency in modern crushed stone operations. It is but another instance where Symons Cones have been chosen by those who want the best in crushing equipment whether for stone, gravel, slag and ore.

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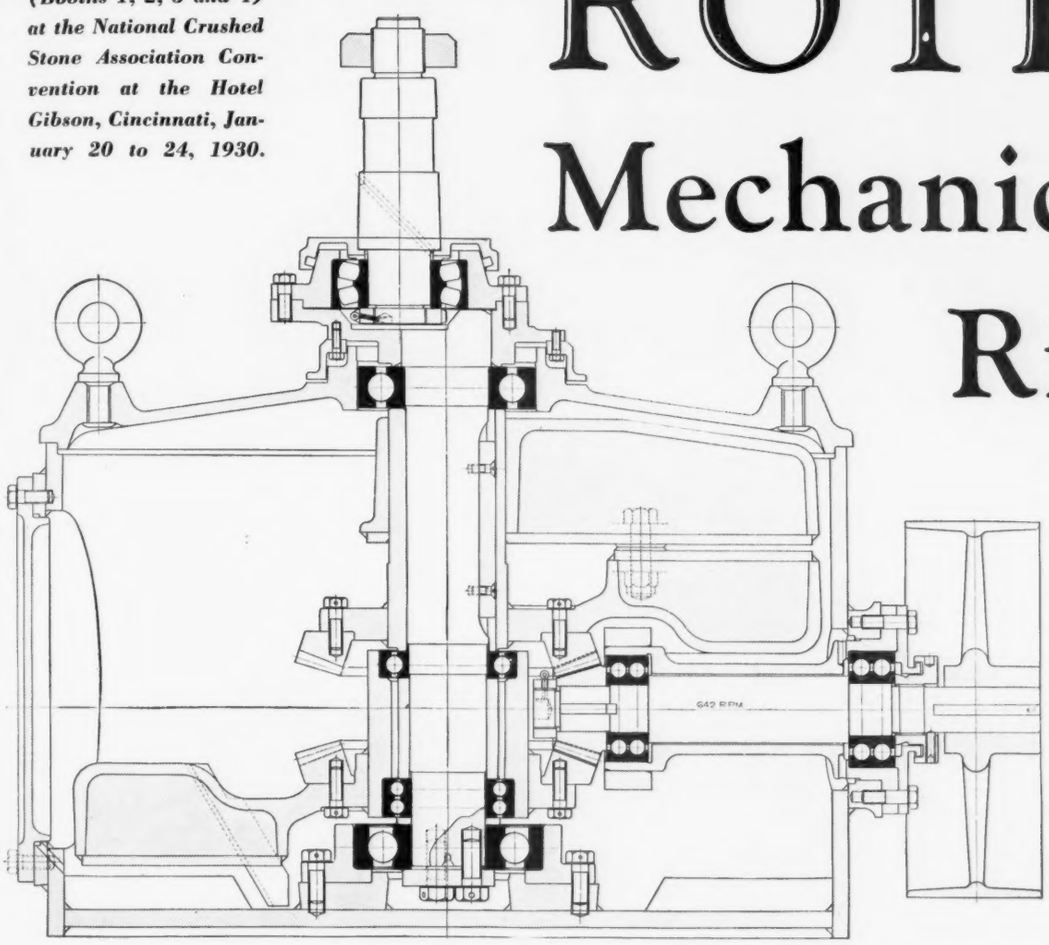
See this drive unit in operation at our exhibit (Booths 1, 2, 3 and 4) at the National Crushed Stone Association Convention at the Hotel Gibson, Cincinnati, January 20 to 24, 1930.

ROTEX Mechanically Right!



Above is shown a cross sectional view of the driving mechanism which imparts the gyratory motion to the screen box of the ROTEX Screen.

Note the rugged construction used throughout, the large, properly placed ball bearings, the positive helical bevel gear drive, and the general accessibility of the entire mechanism.

This unit is totally enclosed in a dust-tight, steel box, and is completely lubricated from the oil reservoir in the bottom of the box.

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Rock Products

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Volume XXXII | Chicago, December 21, 1929 | Number 26

Christmas Greetings

AT this season of the year it is fitting to extend to one's friends expressions of esteem and good will.

IT is in no perfunctory fashion that ROCK PRODUCTS wishes you, who are reading this, and every other friend, a Merry Christmas and a Happy New Year; for it is the tangible evidence of your good will, friendship and confidence that supplies not only the inspiration for our efforts, but their very substance.

AND your kindliness is proof of your sympathy for the goal ROCK PRODUCTS strives to attain—to be more to this industry than a mere record of its current events, or a mere aid in its economic development—to be one of many, but nevertheless a real factor, in making this industry and all business and industry cleaner and better, and a more profitable occupation. In business or industry most of us spend by far the greater part of our conscious hours; and in return industry and business owe us more than a mere livelihood. ROCK PRODUCTS strives to spread harmony and mutual confidence among its readers, as well as facts and information.

PRESIDENT HOOVER has given us a splendid example of what confidence in our country and in our industries can accomplish. No one is likely to fail through lack of such confidence. But we shall all fall short when it comes to extending full confidence to one another. That will take time; and unremitting, constant effort. And only with such confidence will codes of trade practice, rules and regulations of business become more than mere expressions of good intention.

SO, turning the corner on a year that has given all too many examples of the unhappiness and the industrial afflictions that come from a lack of mutual confidence and from too ready exercise of a spirit of retaliation; facing a new year with the expectation if not the assurance of greater business activity, let us all do our utmost to spread and prosper confidence in one another; friends and competitors; may they be one and the same!

Crushed Sandstone for Railroad Ballast

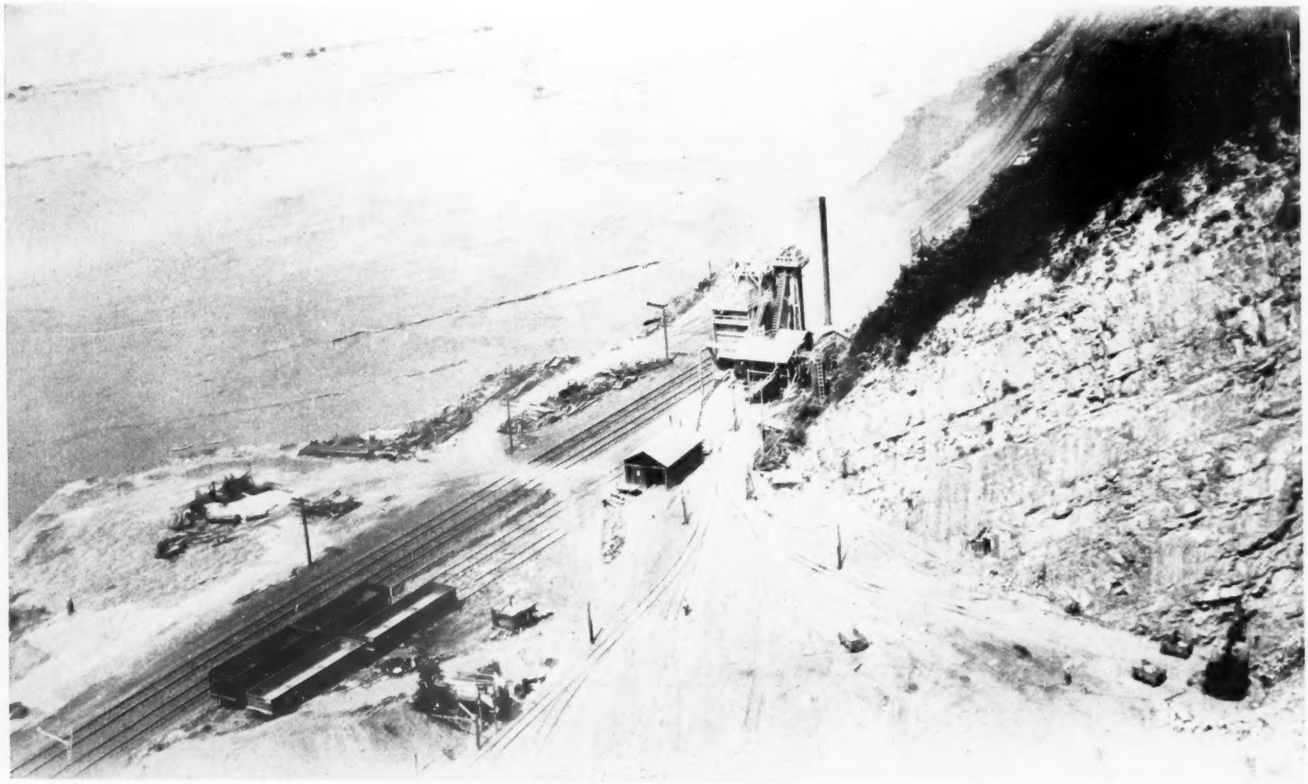
Quarrying a Peculiarly Folded Formation

By R. W. Stone
Pennsylvania Geological Survey

TWO BATTERED OLD STEAM SHOVELS that looked as if they might have been buried by blasting and dug themselves out, were loading quarry cars faster than the crusher could handle the rock. Their names had been carried away with the original housing, so I had to ask the quarry boss what make they were. "Those are Erie shovels," he said, "¾-yd., and doing the work as well as when new. One has been working 14 years and the other about 9 years." And so I interviewed Albert E. Wilkinson, general superintendent of the Susquehanna Stone Co., about the sandstone quarry at Dalmatia on the east bank of Susquehanna River, 20 miles below Sunbury, in the heart of Pennsylvania.

The Susquehanna river above the quarry and crushing plant

This quarry is just above water level in the river bank and because of its size and position is easily seen from the automobile highway a mile away on the other side of the river, but as the highway on the east side of the river is back in the hills, the quarry is well hidden on that side. One must know just which lane to follow to reach the top of the quarry. There is no road to the quarry floor. Development began here about 1902 near railroad level. The crescentic floor has been worked back into the hill until the face is over 200 ft. high. It is not a sheer face for the beds which dip toward the river at an angle of 30 deg. in the lower part of the quarry actually turn over and dip in the opposite direction into the hill at



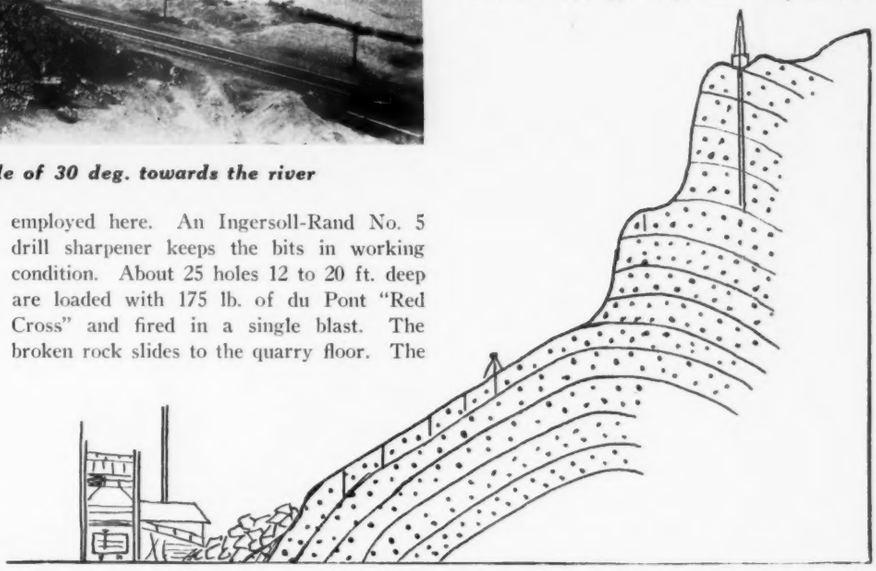
Sandstone quarry and crushing plant of the Susquehanna Stone Co., Dalmatia, Penn. Fifteen tracks radiate from the plant to the quarry face

The quarry face dips at an angle of 30 deg. towards the river

the top of the quarry (see sketch).

During the early operation of the quarry drilling was done entirely with tripod drills, because the slope was too steep for well drills, and tripods are used now in the lower part of the quarry face where the beds dip 30 deg. or more. As the face advanced into the hill the upper beds became nearly horizontal and conditions permitted the use of a well drill. Holes in the flatter beds at the top of the quarry are drilled 50 ft. deep or more and could be drilled 90 ft. to the harder stone which lies at that depth. Holes at the end of the quarry have been sunk 105 ft. The rock structure in the quarry is shown in the accompanying cross-section.

The 30 deg. bedding planes make tilted floors on which men work with the support of an anchored rope to keep them from falling off. Footings have to be made for the tripod drills. Two Sergeant piston drills using solid bits, and an Ingersoll-Rand Leyner drill using hollow bits are employed here. An Ingersoll-Rand No. 5 drill sharpener keeps the bits in working condition. About 25 holes 12 to 20 ft. deep are loaded with 175 lb. of du Pont "Red Cross" and fired in a single blast. The broken rock slides to the quarry floor. The upper beds are broken out with 6-in. holes sunk to a depth of 50 ft. or more by a Sanderson-Cyclone well drill. These holes are spaced 15 to 18 ft. apart and 15 to 20 ft. back from the face. The two Erie shovels load the broken stone into home-made wooden, open-end quarry cars lined with ½-in. steel plates, which are moved to the crusher on 36-in. gage tracks by steel cable operated by two belt-driven Champion drums. A gravity tipple dumps the cars to the primary crusher and the empty cars returning to the quarry face by gravity drag the cable after them. Fifteen tracks radiate from the plant to the quarry face, so that wherever the shovels are located two tracks are in reach. A cable serves each shovel and while one car is being loaded, its mate is being hauled to the crusher and returned. As there are two tipples, the cars from one shovel do not interfere with those from the other shovel. The primary crusher, a Gates No. 7½ gyratory, admittedly is too small to handle easily the 600 tons daily production. The secondary crusher is a No. 5 Champion, which is followed by a Gates screen 24 ft. long and 40 in. in diameter. A 24-in. bucket elevator on 65-ft. centers carries the crushed stone to the top of the plant, and there the fines are screened over a Universal vibrator. The dirt so removed is hauled by auto truck to the river bank and dumped. The plant makes such a clean product that washing equipment has not yet been installed.



Cross section profile of the sandstone quarry illustrating the change in dip of the beds

The crushing plant at which the tough sandstone is processed for railroad ballast

The machinery in the crushing and screening plant is propelled by a Westinghouse 150-hp. motor with electricity purchased from the Pennsylvania Power and Light Co. A Link-Belt silent chain drive is used between motor and line shaft, the rest of the transmission being Goodyear "Commander" belts, in the plant. An Ingersoll-Rand compressor is driven by a 104-hp. General Electric motor and a double-acting centrifugal pump driven by a 20-hp. Westinghouse motor drains the quarry.

Water for the drills is pumped from a 101-ft. drilled well on the quarry floor by a Marsh deep well pump driven by compressed air. The main tank is on the hillside about 80 ft. above the quarry floor and

Left, A. R. Zerbe, quarry foreman, and, right, A. E. Wilkinson, general superintendent

water from this tank will throw a 2½-in. stream over the top of the plant, making good protection against fire. A smaller wooden tank at the top of the quarry is used for drills operating at a level higher than the main tank. Water is raised from the main to the upper tank by an air-driven, double-acting pump.

Working 12-Hr. Shift

In August, 1929, this quarry was working one 12-hour shift and seven days a week to keep up with orders. The product is all shipped by Pennsylvania Railroad and used for highways and railroad ballast. As the rock is tough it is as suitable as trap rock for railroad ballast and 30,000 tons have been sold in a year for this purpose. The rock is hard tough sandstone, believed to be the Oriskany sandstone resilicified by the heat and pressure it was subjected to when folded.

The following physical tests on two types of rock in this quarry were made by the Materials Testing Laboratory, Pennsylvania Highway Department:

Identification No.	R-905	R-906
Specific gravity	2.66	2.76
Absorption, lb./cu. ft.	.25	.40
Per cent. of wear	2.6	5.0
French co-efficient of wear	15.4	8.0
Toughness—average	40	15

R-905 represents 80 ft. of brown and blue homogeneous silicified sandstone in the upper strata, and R-906 represents fine-grained blue foliated lower strata to a depth of 125 ft. at time of sampling. According to M. H. Ulman of the testing laboratory, the upper strata would be preferred for highway use because the crushed stone is more nearly cubical in fracture or equidimensional than that from the lower strata which tends to be shelly or split along the bedding. However, no separation is made and the brown and blue rock from the upper and lower strata are shipped in whatever proportions they come from the quarry. At times all shipments are blue rock, but when the floor has been cleaned up and the upper 20 ft. of strata shot down, the output may be all brown rock.

The office of the Susquehanna Stone Co. is at Williamsport. Residents at Dalmatia are Albert E. Wilkinson, general superintendent; A. R. Zerbe, quarry foreman, and C. W. Zeigler, plant foreman. J. B. Caldwell is president; F. R. Lehman, vice-president; L. R. Maffet, secretary, and R. N. Jaggard, treasurer and manager, Williamsport, Penn.

Production of Natural Sodium Compounds in 1928

THE PRODUCTION of sodium compounds, not including common salt, from natural salines and brines in this country in 1928, as indicated by sales or shipments by producers, amounted to 206,380 short tons, valued at $5,389,728, according to the United States Bureau of Mines, Department of Commerce. These figures include the output of sodium carbonate (soda ash), sodium bicarbonate, sodium sulphate (salt cake and Glauber's salt), trona, and sodium borate (borax and kernite), and show a large increase in both quantity and value as compared with 1927 partly on account of the continued development of kernite deposits.

The sodium carbonates reported were all from California and amounted to 79,830 short tons, valued at $1,578,256. Sales of sodium sulphate amounted to 6,580 tons, valued at $42,485. The total boron minerals shipped in 1928 amounted to 131,000 tons, valued at $3,999,773.

View at the quarry floor. Note the peculiar bedding and dip of the rock

Waste Heat Recovery at the Security Plant of the North American Cement Corporation

WHAT may be considered the most outstanding of recent cement-mill, waste-heat recovery installations is that made at the North American Cement Corp. plant at Security, Md., an industrial center located three miles from Hagerstown on a branch line of the Baltimore and Ohio railroad.

Fundamentally there is little difference between the installation at Security and other Edge Moor installations made during the last few years. However, in building the Security plant advantage was taken of all previous experience, and various refinements not incorporated in many of the earlier plants were included in the design and construction of the Security plant.

Characteristic of the standard Edge Moor design for waste-heat installations, the Security plant contains a main flue connecting the kilns to the boilers. The boilers themselves are the box header type of boilers, built with a high tube bank and arranged to pass the gases four times across the bank of tubes. A Foster economizer is located below the fourth pass of the boiler and within the boiler setting. Fans built by the Green Fuel Economizer Co., and designed by them in conjunction with Edge Moor engineers for handling the gases from cement kilns, draw the gases through the flues and the boiler settings.

The new turbine building at the Security plant

Various Improvements Incorporated in Design

In addition to the above standard features, various improvements tried out at other plants have been incorporated in the waste heat installation at Security. For instance, study of earlier installations has determined the most satisfactory type of cleaning doors, observation doors, and access doors and the most suitable locations for platforms to give easy access to the system for handling the removal of dust from the system. The Security plant is liberally supplied with platforms and with doors for observation and cleaning based on the experience at other plants.

Again experience at other plants has proved the advisability of installing instruments for recording drafts, temperatures and performance at various parts of the system, and the Security plant is liberally provided with such instruments so they can easily keep a complete check on the performance of the plant.

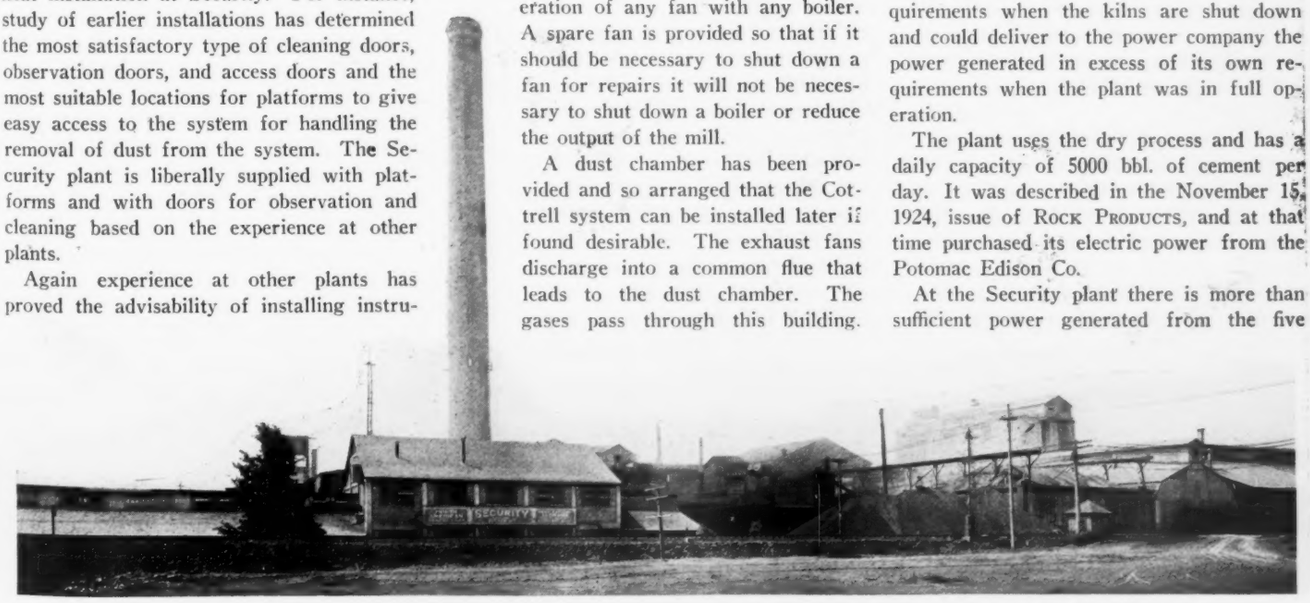
Different from some plants in physical layout, the Security plant, eliminating individual kiln stacks, has a single large stack at the end of the main flue to provide for exhausting of a portion of the gases direct to the atmosphere in case some of the waste heat boilers or turbines should be shut down and thus unable to take all of the gases from the kilns. Also, instead of having a single exhaust fan connected to each boiler, the Security plant has a flue between the economizers and the exhaust fans, referred to as a "common fan flue," which permits the operation of any fan with any boiler. A spare fan is provided so that if it should be necessary to shut down a fan for repairs it will not be necessary to shut down a boiler or reduce the output of the mill.

A dust chamber has been provided and so arranged that the Cottrell system can be installed later if found desirable. The exhaust fans discharge into a common flue that leads to the dust chamber. The gases pass through this building. Much of the dust of the gases is settled out due to the slowing up in the velocity of the gases. This building is connected to the large stack at the end of the main flue by a short connecting flue, so that one stack serves to exhaust the gases to the atmosphere either before or after they have passed through the waste heat system.

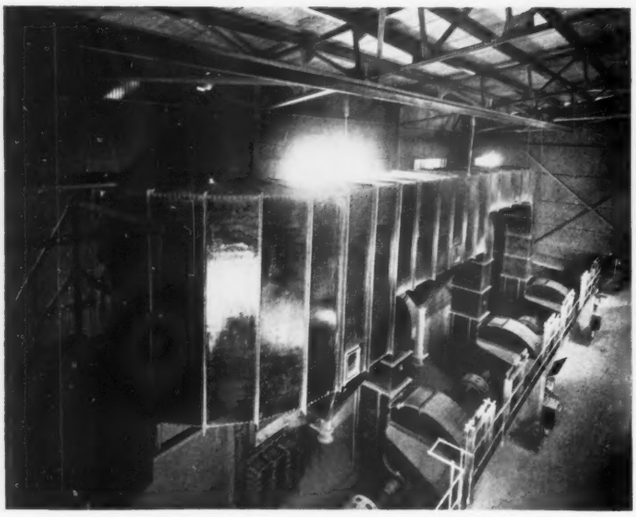
Another feature of the Security plant is that no spare boiler has been provided to furnish power when the kilns are shut down or for starting the kilns. Anticipating from the nature of its raw materials and its process that it would ordinarily have more power than its normal requirements, the North American Cement Corp. made arrangements with the local power company for exchange of power so that it could call upon the power company for its requirements when the kilns are shut down and could deliver to the power company the power generated in excess of its own requirements when the plant was in full operation.

The plant uses the dry process and has a daily capacity of 5000 bbl. of cement per day. It was described in the November 15, 1924, issue of ROCK PRODUCTS, and at that time purchased its electric power from the Potomac Edison Co.

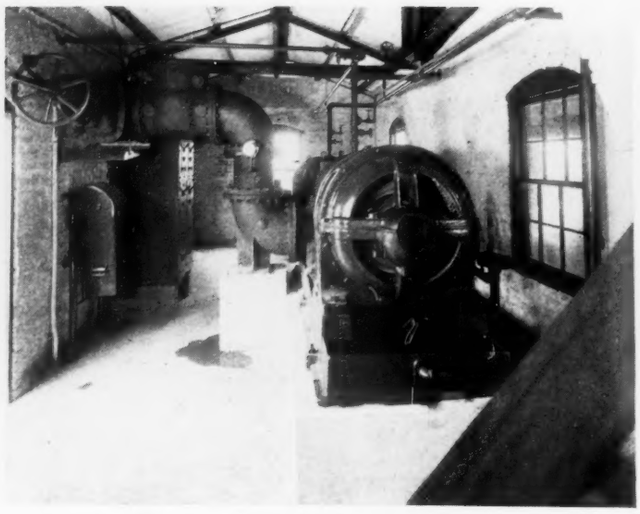
At the Security plant there is more than sufficient power generated from the five



General view of the Security, Md., plant of the North American Cement Corp.



Fans and exit flue from fans to precipitators

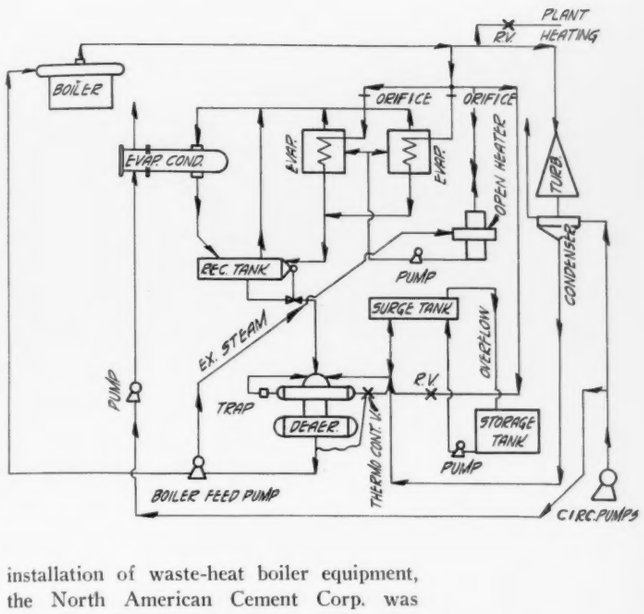


Motor and pump in the intake house

rotary kilns, when all the kilns are operating, to supply sufficient electricity to operate the entire plant and quarry, which includes the compressors and electric shovel. Besides, under these conditions approximately 20% of the total power generated is sold to the Potomac Edison Co. under the power exchange agreement referred to, the power company supplying the cement plant in case there are not sufficient kilns operating to run the remainder of the plant.

In revamping its plant at Security for

Side and rear view of the three waste-heat boilers



Left—Diagram of steam flow at Security plant. Right—The evaporators and deaerating equipment

installation of waste-heat boiler equipment, the North American Cement Corp. was obliged to install not only the boilers but also new electric generating equipment. After considering various possibilities for the installation of this equipment, it decided to give the entire contract, including waste-heat boilers, boiler house, power generating equipment and power house, to the Edge Moor Iron Co. The contract was taken late in September of 1927, but by July 1, 1928, the plant was able to start operating on the waste heat from the kilns.

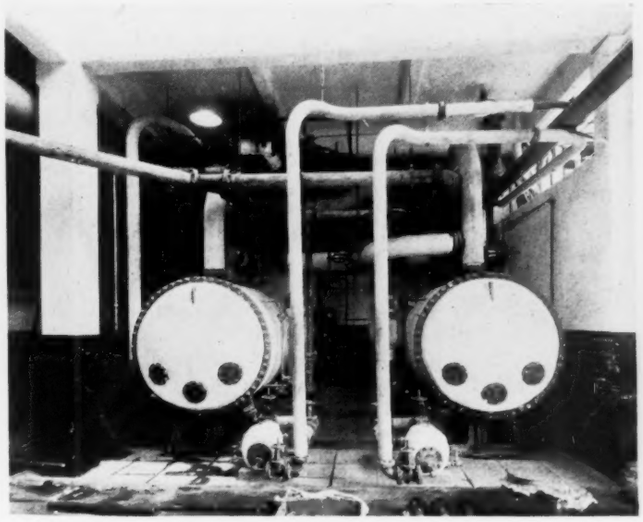
Prior to the placing of this contract, the North American Cement Corp. had decided to go ahead with the waste-heat boiler installation and as the first step undertook the connection of the five kilns to a common main flue, having a single exhaust stack at the end of the flue. The design of flues and connections was furnished by the Edge Moor Iron Co., but the work of constructing the main flue was performed by the North American Cement Corp. in order that this work might be handled with the least interference with plant operation. The construction of the new main flue had not been completed when the work was started on the plans of the waste-heat boiler plant and the power plant.

The arrangement of the waste-heat recovery equipment in this plant is characteristic of the Edge Moor design. The five kilns are connected to a common collecting flue, from which the gases are drawn through three waste-heat boilers, and then into another common flue, referred to as the "common fan flue," from which the fans exhaust the gases from the system.

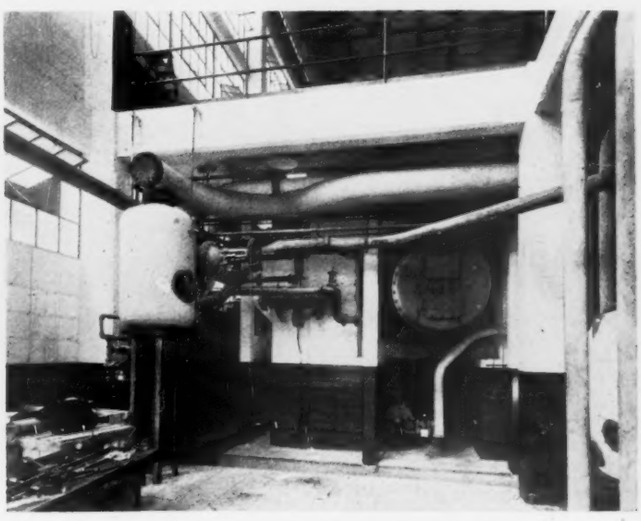
Each of the three 1006-hp. waste-heat boilers is an Edge Moor boiler of special design for waste-heat service, each having banks of tubes 22 rows high and 18 tubes wide, with two steam drums, the total area of each boiler having 10,062 sq. ft. of heating surface. The boilers are built for a working pressure of 225 lb. and before being placed in service were subjected to a hydrostatic test up to 338 lb. pressure.

Each boiler is equipped with a Foster superheater designed to increase the steam temperature 150 deg. at 225-lb. pressure.

The boilers are arranged for four passes



Heaters, evaporators and piping

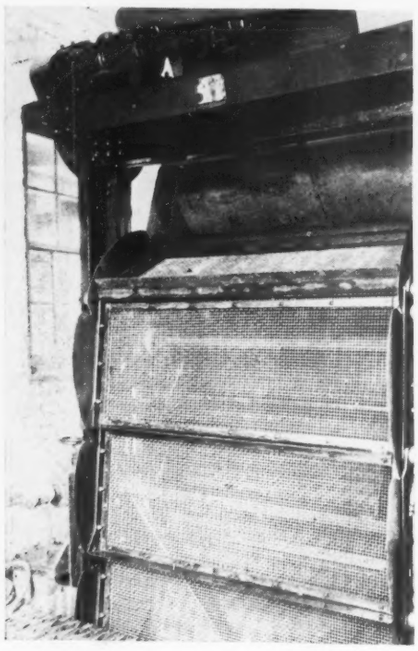


One of the 5000 sq. ft. surface condensers

The No. 2 turbo-generator with deaerator, overhead crane and switchboard (rear)

of the gases across the tube bank. After leaving the last pass of the boiler, the gases are drawn through Foster economizers, 4390 sq. ft. of heating surface each, located within the boiler setting and directly under the fourth pass of the boiler. From the economizers the gases are exhausted into the common fan flue.

Platforms at sides of boilers for easy access and cleaning have been provided, and specially designed cleaning doors, access doors, and observation doors, have been installed in the boiler settings and in the flue chambers to facilitate observation and easy operation of the plant.



A traveling screen protects the intake of the circulating pump

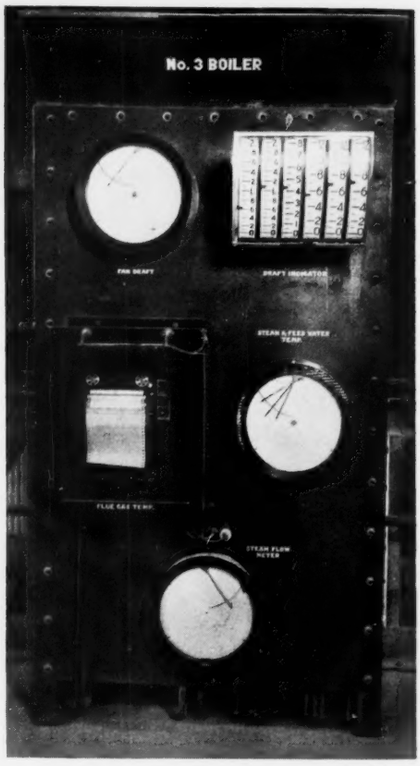
The general design is such that if desirable the hot gases can be passed directly to the stack, bypassing the waste-heat plant entirely. The stack serving this gallery is 262 ft. high, 15 ft. internal diameter at the top and 23 ft. at the bottom, and was built by the Heine Co., of New York.

On the opposite side of the common fan flue from the boilers are located three induced draft fans specially designed for waste-heat service and built by the Green Fuel Economizer Co. These economizers are No. 9½- S.A., double inlet, full-housing, three-quarter type, upblast induced draft. There are also three sets of inlet boxes made from No. 8 gage steel plate weighing 23,940 lb. The induced-draft fans are especially designed for portland cement waste-heat conditions with special reference to the elimination of the possibility of dust settling in the housing and causing stoppage of operations by the Green Fuel Economizer Co.'s engineers, and are each direct-connected through a Bartlett-Hayward Co. flexible coupling to a 225-hp. General Electric motor. The fans handle a gas having a density of 0.051 at a rate of 108,800 cu. ft. per min., or 333,000 lb. per hour, at 380 deg. F. temperature.

The foundations for buildings and for equipment and the buildings themselves, in both the waste-heat boiler plant and the power plant, were furnished by J. B. Ferguson Co., of Hagerstown, under contract with the Edge Moor Iron Co. The brick work on the boiler settings was done by the Edge Moor Iron Co., there being 80,000 standard fire bricks and 80,000 red bricks for each boiler and kiln connections.

An instrument panel, equipped with recording and indicating instruments to measure the temperature and draft at various points in the system, is furnished with each boiler. These were supplied by the Brown Instrument Co. and include a No. 203 recording integrating steam flow meter, draft indicators, both recording and indicating types, steam and feed water temperature recorders. There are also five 12-in. recording draft gages, one being for each kiln. These instruments were supplied by the Foxboro Co. of Philadelphia.

The steam from the boilers passes through a 10-in. line to the new power house which, with the intake house and all



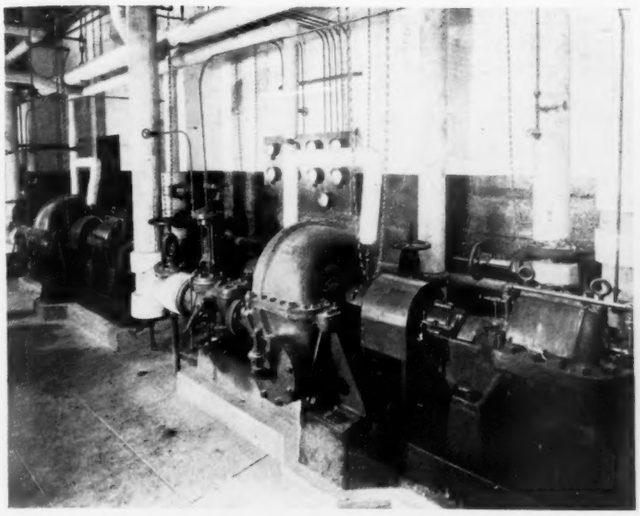
Each boiler is equipped with an instrument control panel

the power plant equipment was furnished by the Edge Moor Iron Co.

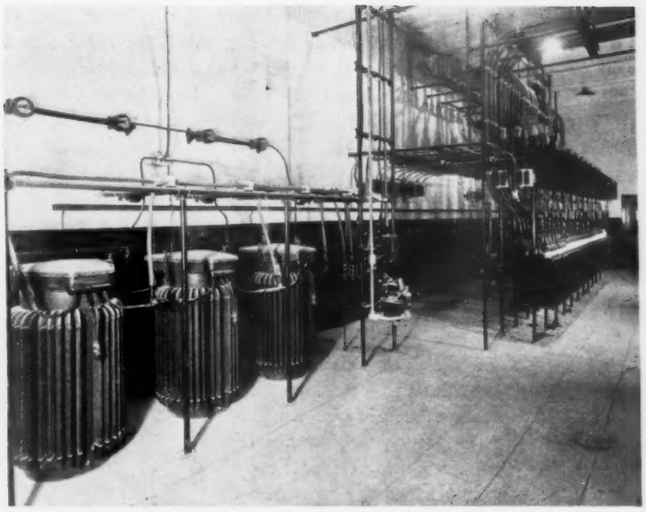
The power house contains two 3000-kw. General Electric turbo-generators, Form HT, Type ATB, 3750 k.v.a., 3600 r.p.m., 2300 to 4000 volts, armature amp. 941/541, field amps 182, P.F. 80.

There is a General Electric switchboard, specially designed for the conditions at this plant, and G.-E. station transformers. The installation of this equipment and all wiring was done under the direction of the General Electric Co.'s engineers.

The condensers are Worthington surface condensers of 5000 sq. ft. The evaporators and deaerating equipment was furnished by Griscom Russel Co., and consists of heaters,



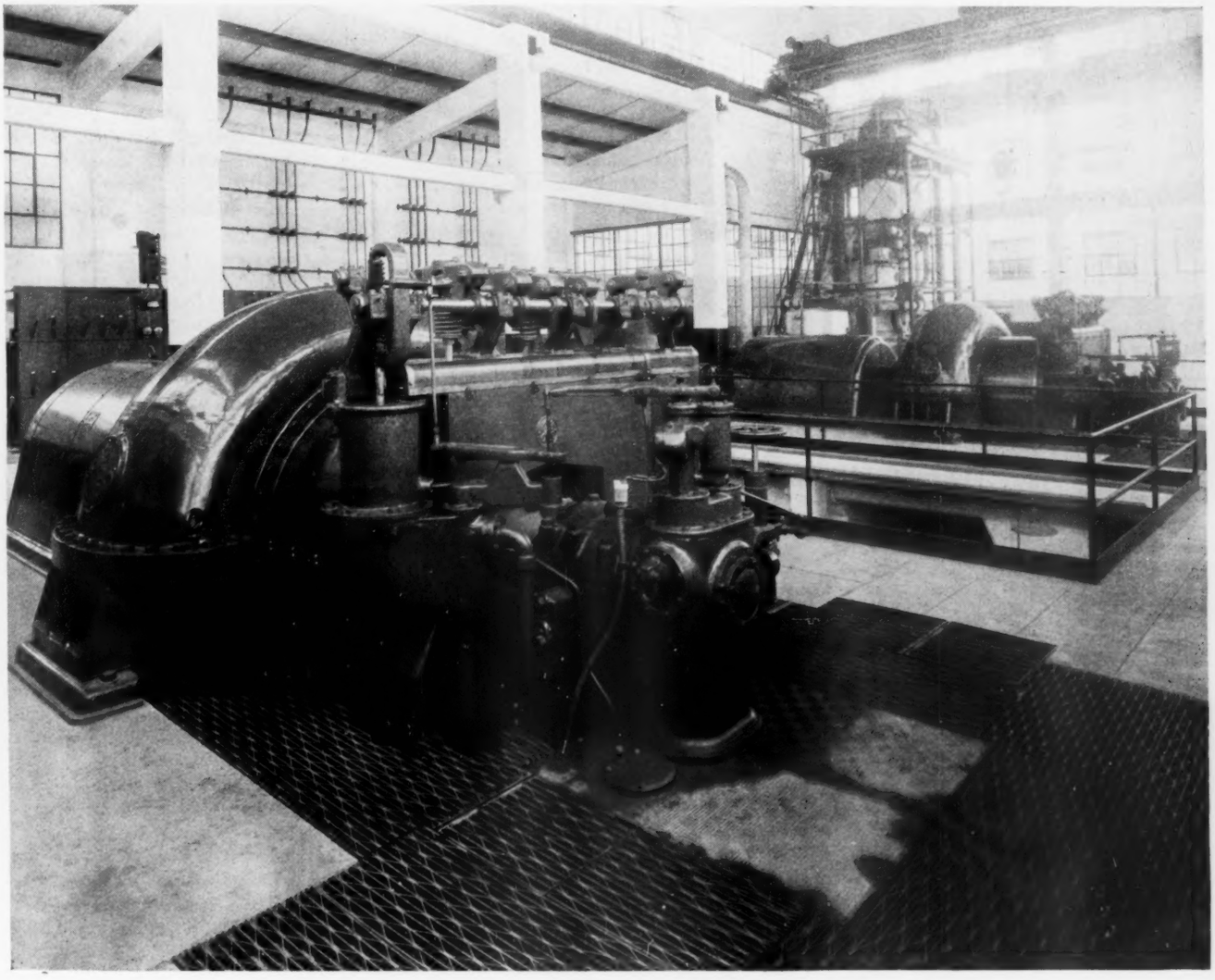
Turbine-driven boiler feed pumps



Transformers, oil switches and buses

evaporators, deaerators and surge tanks. The boiler feed pumps are the Worthington make, driven by G.-E. steam turbines. The traveling crane in the power house was furnished by the Whiting Corp. and is of 20-ton capacity. The oil filters and oil storage were furnished by the S. F. Bowser Co. All piping in the boiler house and power house was furnished by W. K. Mitchell Co., and pipe covering was furnished by Thomas J. Nicely. The recording and indicating instruments used throughout the plant are principally Brown and Precision instruments.

The water used for cooling the turbines,



Interior of the turbine room, showing the two 3000-kw. turbo-generators

turbine condensers and evaporator condensers is secured from a small creek flowing by the plant, by means of two 16-in. Worthington centrifugal pumps, Class O.S., 7200 gal. per min., under 49-lb. head. The unit is directly connected to a 150-hp. General Electric motor and operates at 870 r.p.m. This motor uses 440-volt, 60-cycles, 3-phase current.

This small creek, Antietam Creek, is of historical interest, and the Battle of Antietam was fought only a few miles from the Security plant.

The suction of this pump is protected from infiltration of leaves, weeds, etc., by a Link-Belt traveling screen having a width of 5 ft. and a center-to-center distance of 16 ft. 6 in. This screen travels vertically and on the down-moving and down-stream side water is sprayed from within the screen to remove any obstruction. The wide screen panels operate on suitable chains at each side and travel at 10 ft. per min. The screen has ample open meshed area to supply 15,000 gal. per min., and is driven by a 3-hp. General Electric motor.

The executive offices of the North American Cement Corp. are at 40 Howard St., Albany, N. Y. F. W. Kelley is president; J. J. Porter, vice-president and general manager, and F. A. Boeye is vice-president and sales manager. The operating officials at the Security plant are: E. S. Guth, superintendent; P. A. Leichel, assistant superintendent; J. H. Zaizer, chief engineer; E. Taylor, quarry foreman; Walter Staats, mill foreman, and C. H. Miller, chief chemist. Robert Boeye is the local sales manager.

Sand and Gravel in New York State

NEW YORK is the first state in the production of sand and gravel, the annual output being not far from 20,000,000 tons, and the value $10,000,000 or more. It has many well conducted operations among them being what is possibly the largest in the country, one of the Goodwin-Gallagher Sand and Gravel Corp. pits, producing 18,000 cu. yd. daily. Hence the recently published report by Charles M. Nevin is of unusual interest to the industry. It is called "The Sand and Gravel Resources of New York State," and it is published by the University of the State of New York, at Albany, as "New York State Museum Bulletin No. 282." Mr. Nevin is assistant geologist of the New York State Museum.

One thinks first of glacial deposits when he thinks of the sand and gravel industry of New York, but this book lists seven types of deposits, all of which are commercially worked. They are: Wind deposits, river deposits, delta deposits, lake deposits, marine deposits, glacial deposits and glacial river deposits. Glacial and glacial river deposits produce much the greater part of the state's tonnage, but the river deposits are important for the core and molding sands they contain. Even the dunes and the wind swept plains are valuable since they produce the finer grades of core and molding sand and some asphalt sand.

The geology of all these is discussed, although greater attention is paid to the glacial and glacial river formations. The discussion of these includes a general explanation of glaciation and its causes, but it properly stresses those facts which have a bearing on sand and gravel production. Delta deposits with their almost vertical foreset beds and flat topset beds are explained and diagrammed, and it is easy to see why producers are often unpleasantly surprised to find such a deposit entirely changed in character after a short period of working.

The author appreciates this and emphasizes the value of proper sampling, saying: "Improper sampling may condemn an intrinsically good product, or may cause an investment in a sand and gravel bank to be of no commercial value. The very nature of the conditions under which sand and gravel deposits are formed usually guarantees quick changes in both texture and composition so that a uniform bed of any extent is decidedly the exception, and a representative sample is difficult to obtain."

The author's conclusions on testing sands and gravels are interesting, for he says that it appears to him that the present methods of testing their durability and strength are not very satisfactory, that there have been too many failures traced to unsound aggregates and that some sort of test is needed, "if only to bring out the microscopic flaws which are invisible to our eyes." But this should be read in connection with a later statement in which he says:

"The best of workmanship cannot counteract the use of poor aggregates and the best of aggregates can not make up for faulty mixing and placing. It costs more money to make good aggregate, yet the product obtained with good aggregate and poor workmanship may not be so reliable as that obtained with poor aggregate and good workmanship. Usually the blame for unsatisfactory results has been heretofore placed on poor aggregates, but with the recently developed control methods and tests, the sand and gravel industry is now able to place the blame for failures where it really belongs and is in a position to meet any fair type of competition."

As is usual in reports of this kind, considerable space has been given to methods of working deposits. Fortunately, in this report there is not the usual compilation of extracts from technical books and papers, but a real discussion of methods and machines. The observation of the author is unusually keen and his criticisms are well founded. For example, he notes that a large number of operators would like either to move their plants or turn them around, and he discusses how such a condition comes about in the course of an operation and how it might be avoided. He notes that there are about as many systems of excavating and handling as there are plants, and of course not all are of equal merit. Special attention is given to excavation because, in his opinion, production on a large scale is merely a problem in excavation, and it is his belief that a half dozen economically sound methods of digging sand and gravel should be enough to cover all cases.

His analysis of methods and their application is therefore unusually interesting, and while it is brief every word is important. After reading it one should have a fair understanding of the principal methods in use and why one should be used instead of another.

The greater part of the book is given to a description of the operations of the state listed by counties. While these are short they are generally adequate in that they give the most necessary information. The reviewer is familiar with many of the plants described and can appreciate the work that went into this portion of the report and how well it is done. Molding sand, a somewhat neglected subject in sand and gravel literature, forms an important part of the state's production and it is well handled in this report. The grading and other important characteristics of the sands from several important deposits are given, and these will prove helpful to those who have deposits that they hope to find may have commercial value. Some glass sands are described in the same way.

The statistical portion of the report includes rather detailed figures of production, mostly brought up to no later date than 1926, however. There is a very valuable table which gives the grading, loam content and mortar strengths of 94 concrete sands, taken from all parts of the state and a shorter table of gravels. The latter gives the lithological percentages of each and it may surprise one who thinks he knows the gravels of the state to find how large a number contain considerable percentages of limestone. Sandstone pebbles predominate, however, taking the gravels as a whole.

A good bibliography is included and there are 32 pages of excellent photographs. The most important of these from the student's point of view are the pictures showing different types of deposits. The style is unusually readable and the printing and paper are good and the index covers individual plants as well as counties and general subjects. It is unfortunate that a map was not included.

Diesel Engines in the Rock Products Industries

Part IV.—Applications to Portable Machinery and Equipment—Draglines, Shovels and Locomotives

By Orville Adams
Dallas, Texas

THE DEVELOPMENTS during the past two years of Diesel engine applications to mobile and portable equipment in the rock products industries by the engine builders in cooperation with equipment manufacturers is perhaps the most significant economic factor as well as technical advancement ever experienced by the engine builders or the equipment manufacturers.

The result has been a more economical, sturdy and reliable machine, whether locomotive, dragline, shovel, tractor, or stationary plant, and informed users who are buying this new Diesel-equipped machinery have kept records which certainly and unmistakably mean a new era in power plants for such applications. I believe the Diesel engine is destined eventually to almost completely supplant the gasoline engine in these fields.

That these developments are bringing great economies to the rock products industries is conclusive, and without risk, as the Diesel has long since emerged from an era of experimentation.

Economic Conditions Favor Diesel

Economic conditions contribute to the adoption at all times of improvements and advanced designs by these industries, and very few activities in the rock products business at the present time permit operation and continued use of obsolete equipment. For this reason the supplanting of the gasoline engine in the heavy duty applications with the light high-speed Diesel engines will be much more rapid than that of the gasoline engine in supplanting steam for the operation of such machines. One of the contributing factors has been the fact that the builders of gas engines and this type of equipment ignored the burden placed upon the user by high-priced gasoline, with state road tax added, with so very few states having laws for rebate of the tax, particularly to road builders, and associated industrial users of gasoline.

On the other hand the demand for more power, better torque and fuel economy is equally important. The saving is often as much as 50%, with proved increased output. Speed, ever increasing in importance, is another advantage of no little moment, and all these things, the Diesel brings to the industry in these machines.

Another significant fact is that with few exceptions the builders of heavy duty gas engines are experimenting or have already developed Diesel engines and where now can be found the manufacturer of locomotives, draglines, shovels, cranes, or like who is not building the Diesel-equipped machine?

On the other hand, there is no reason why the price of Diesel-equipped machinery should be higher than for similarly equipped gasoline driven applications, other than the matter of mass production and demand; and this is in evidence, as there are a number of mergers and consolidations going on which will make the Diesel-engine business big business; and soon the same advantages of mass production will be available to the user of Diesel-equipped machines. So that it may be expected that this objection will be short-lived.

Of the same temporary nature is the objection of the user that engine operators are not familiar or capable of operating successfully Diesel-powered machines. In some cases builders of the equipment have propagated the belief that only large fleet owners are able to have Diesel engineers to care for and operate such equipment. The first users to pioneer with equipment powered with Diesels, in the majority of cases, were small contractors and producers who had both the necessity and the courage to adopt what was considered an innovation—in other words, men who had to risk all to gain certain definite and necessary advantages of economy in order to operate at all. As in all advancement the larger firms prefer to let the smaller fry do the experimenting. This practice is a well known fact.

COST OF ONE B.H.P/HR. WITH VARIOUS FUELS IN DIFFERENT TYPES OF INTERNAL COMBUSTION ENGINES

TYPE OF ENGINE	FUEL	COMP. RATIO	SPEC. GR. BE.	CENTS PER GAL.	LBS. PER GAL.	CENTS PER LB.	LBS. PER B.H.P/HR.	COST-CENTS PER B.H.P/HR.
OTTO CYCLE SPARK IGN.	KEROSENE	4:1	44	12.7	8.72	1.89	.80	1.51
"	MOTOR GASOLINE	4½:1	59	14.8	6.17	2.40	.65	1.56
"	ETHYL MTR. GAS.	5½:1	59	17.8	6.17	2.88	.60	1.73
"	AVIATION GASOLINE	5½:1	63	19.8	6.04	3.28	.52	1.70
"	ETHYL AV. GAS.	7:1	63	22.8	6.04	3.78	.48	1.82
COMP. IGN. DIESEL CY.	FURNACE OIL	12/16:1	38	10.2	6.94	1.47	.38	.56
"	DIESEL OIL	12/16:1	24	7.0	7.57	.93	.38	.35

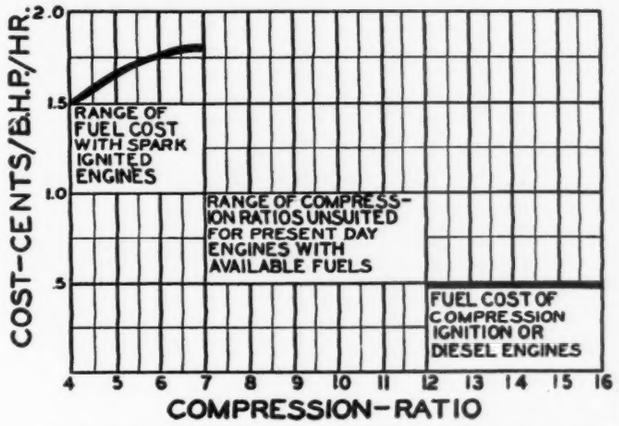

COST-CENTS/B.H.P./HR.
2.0
1.5
1.0
.5
RANGE OF FUEL COST WITH SPARK IGNITED ENGINES
RANGE OF COMPRESSION RATIOS UNSUITED FOR PRESENT DAY ENGINES WITH AVAILABLE FUELS
FUEL COST OF COMPRESSION IGNITION OR DIESEL ENGINES
4 5 6 7 8 9 10 11 12 13 14 15 16
COMPRESSION-RATIO

Fig. 1. Comparison of Diesel and gasoline power costs

Advantages of the Diesel Engine

Examination of the record of Diesel applications to replace the gasoline engine shows that there are several factors that outweigh the considerations of first cost, operating difficulties, if any, and availability of fuels. The Diesel engine will replace the gasoline engine for very obvious and simple reasons, viz.:

1. The Diesel engine is inherently more reliable than the gasoline engine for the simple reason that an electrical ignition system is eliminated, and a separate fuel injection is applied to each cylinder, thus insuring maximum dependability.

2. The specific fuel consumption is 20% and upwards less by weight than that required for the gasoline.

3. The actual fuel cost is reduced 80%, the difference in fuel price and gasoline prices.

4. The Diesel requires no more attention and service or technical operating skill than the gas engine, and employs the same kind of auxiliaries.

5. The temperature and humidity conditions don't affect the operation of the engine, the engine operating in one climate as well as another.

6. Better torque at lower speeds, faster pickup and more reliable ignition are special advantages.

7. There is no fire hazard, and danger in handling the fuels to and from jobs. The fire hazard is reduced to an absolute minimum, as the fuel oil is not explosive.

Authoritative Reports

A most authoritative study of this subject is shown below, taken from a recent paper by Col. J. G. Vincent, entitled, "Various Types of Internal Combustion Engines and Their Fuel Requirements," which makes a comparison of the costs of Diesels and gasoline engine power. It should be noted that the fuel cost is about one-fifth as much, which means a saving of not less than 80% over the gasoline engine in fuel costs. Prices of fuels are given for tank car lots and accurately calculated. Consumption is based on tests and fuel consumption guarantees for the various standard types of engines available.

It should be said that these figures are in line with the cumulative experience in the field and confrom to the fuel economy and operating charactesistics of the engines discussed in this paper. In short the figures are reliable and can be depended upon as accurate.

Diesel and Steam Shovel Costs

Basis of Operation	Shovel P & H Diesel	Shovel Steam
Initial Investment	$18,000	$13,000
Depreciation Period	5 years	5 years
Operating Crew	2 men	5 men
Days worked per year	275	275
Time per day	9 hours	9 hours
Bucket Capacity	1 yard	¾ yard
Average handling per day	260 yards	175 yards
Annual Fixed Charges		
Depreciation	$3,620.00	$2,600.00
Average Interest at 6%	651.60	468.00
Repairs and Maintenance	1,200.00	1,000.00
Total	$5,471.60	$4,068.00
Daily Operating Expense		
Fixed Charges	$19.90	$14.79
Labor:		
Operator—9 hrs. @ 65c	5.85	5.85
Pit man—9 hrs. @ 40c	3.60	3.60
Fireman—10 hrs. @ 39c	——	3.90
Wood bucks—2, 9 hrs. @ 40c	——	7.20
Fuel:		
18 gal. @ 10c delivered	1.80	——
Wood and Water	——	3.00
Lubr. Oil and Grease	1.75	0.40
Daily Totals	$32.90	$38.74
Unit Costs and Savings		
Average cost per yard	$ 0.127	0.221
Net Saving by Diesel shovel:		
Per yard	0.094	——
Per day ($0.094 x 260)	$24.44	——
Per year ($24.44 x 275)	$6,721.00	——
Annual Return on Investment		
On total Diesel cost	37 per cent	
On added cost of Diesel shovel	132 per cent	

Performance of Diesels

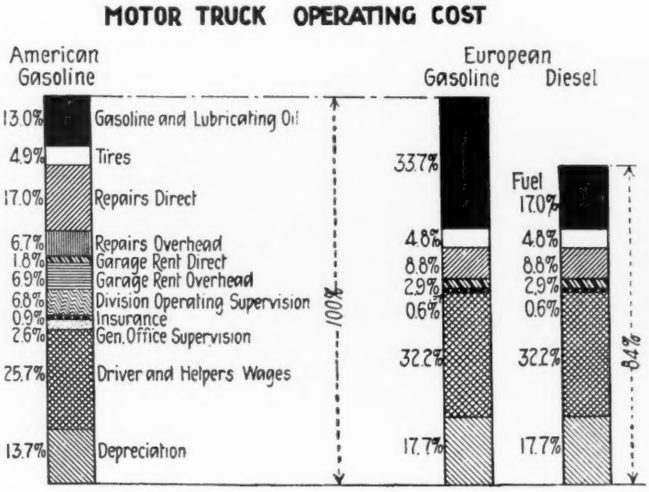
Special advantages of Diesel-engine applications in this class of machinery was ably discussed by C. H. Gibbons, before the second national meeting of the oil and gas power division of the American Society of Mechanical Engineers, June 24, 1929, and published in the *Transactions* of the A. S. M. E. In reference to excavating machines and the advantages of the Diesel over the gasoline engine, Mr. Gibbons stated:

From the standpoint of operating characteristics, steam has always been and still is the ideal to which excavating machine designers look. The quality most uniformly commended is the ability of the ungoverned, throttle controlled steam engine to give a uniformly rising torque with decreased speed—the "tugging" trait—the ability to pry out obstructions. A glance at the graph (Fig. 2) will reveal how far from the ideal the carburetor gas engine is and how much better the Diesel—the torque increase at lower speed being nearly 30% for the same size engine. Also, a lower final speed before stalling may be had with the Diesel. These factors, in addition to fuel economy, have made this field particularly fertile soil for the high-speed Diesel.

Further study of the graph will also show the manner in which the shovel designer has availed himself of the fine torque characteristic of the high-speed Diesel in combination with the added flexibility in design of the electrical transmission to effect speed torque characteristic. For after all, in power excavator service, torque is equally important with power. Through a part of the speed range the importance of power is predominant, but through another portion, torque governs. The designer must in some way meet both of these requirements in order to make an excavator which will be profitable in service and therefore satisfactory to the purchaser.

Fuel costs of less than a cent per cubic yard have been found to be common on Diesel-powered excavators by a prominent company building this class of equipment. Since the gasoline engine "breaks" at about 50% normal speed, while the Diesel "hangs on" to about 30%, outputs are about 10 to 15% higher with the Diesel than with the gasoline engine. The fuel is about half in quantity and the fuel cost is therefore from one-eighth to one-tenth, as the price variation per unit is four or five. An estimate of the costs has recently been published

TABLE II. COMPARATIVE TRUCK OPERATING COSTS IN UNITED STATES AND GERMANY



by this company. The estimate shows for a 1-cu. yd. machine in a 200-day operation a year a savings of $2230 over the gasoline-operated machine of the same size; interest and depreciation being properly accounted for.

A careful study of this graph brings out completely the entire story of the Diesel under such conditions and fully explains the preference of many producers in the rock products industries for this type of power for their machines.

Development of High-Speed Diesels

For the past five years at least the major interest in Diesel engine circles has had to do with development of the high-speed small Diesels; and at the present time announcements are being made of new engines every month or so by the leading builders of Diesels and heavy duty gas engines. Therefore, several well established designs are on the market and in use in every conceivable application in the rock products industries, one of the two principal fields for the application of such types of machine. Standard applications at the present time comprise such machines as the concrete mixer, road tractor, locomotive and tractor cranes, draglines, land-borne excavators, shovels, locomotives, portable compressed-air plants, well-drilling rigs, dredge pumps, tow boats, hoisting engines, centrifugal pumps and small lighting plants. There is available an engine for practically any sort of application desired in this field.

The shovels, draglines and dredges were the first to make extensive use of the Diesel engines. This movement spread so fast that motor trucks are already considered logical Diesel engine outlet, and the airplane Diesel has been perfected. The three past Road Shows have exhibited all these important uses of this type of prime mover until the Diesel engine has become a very important feature of the annual Road Show. Since the Diesel manufacturers discovered the rock products industries, hundreds and perhaps thousands of Diesels have been sold for this field. It is very likely that the major market is the rock products and allied fields. The road builder proper will doubtless find the Diesel-powered machines an answer to many difficulties he is facing in the present highly competitive situation. It is established that the life of the Diesel is considerably longer than that of the gas engine, the upkeep and maintenance is less than for steam, particularly in locomotives and heavier machines. The problem of fuel and water is further simplified, and greater flexibility of operation is afforded, because these engines are built with a full realization of the desired flexibility and adaptability required of the machines in which they are used.

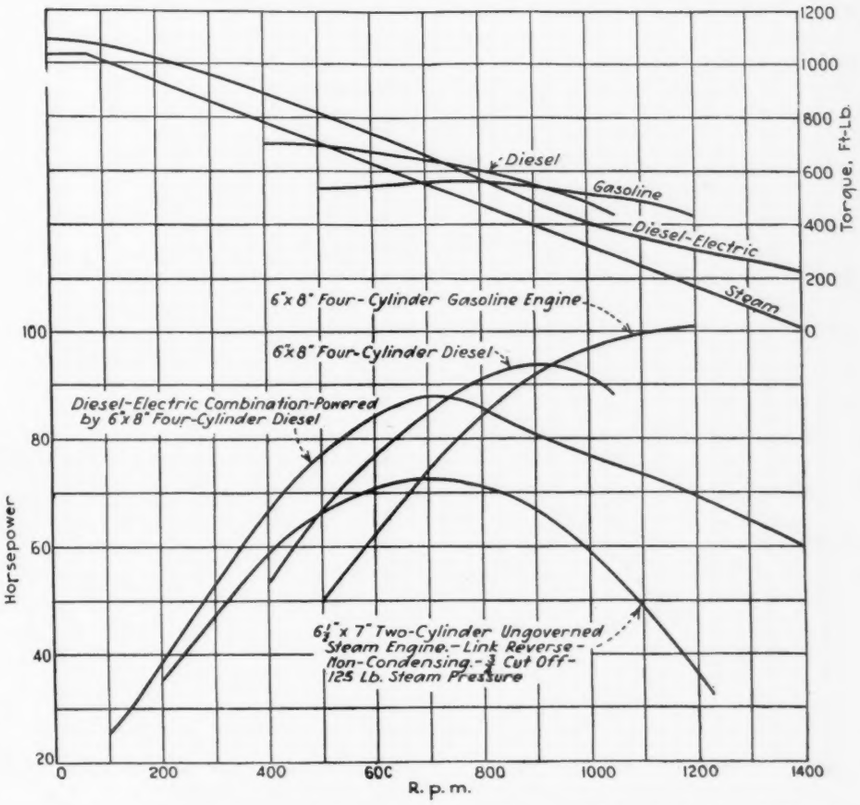


Fig. 2. Comparative speed-torque and speed-power characteristics of Diesel, gasoline, Diesel-electric and steam-driven excavators

Auxiliary Equipment

In most every installation found, ample provision has been made for necessary auxiliaries, such as protective devices against contamination of the fuel, lubrication and air, as well as properly designed radiators for cooling water. Air filters, oil purifiers, and provision for circulating suitable water is standard. The builders looked ahead and capitalized experience with stationary engines in these respects, so that these applications are designed for satisfactory operation from the outset.

In design and appearance many of these engines resemble the conventional heavy

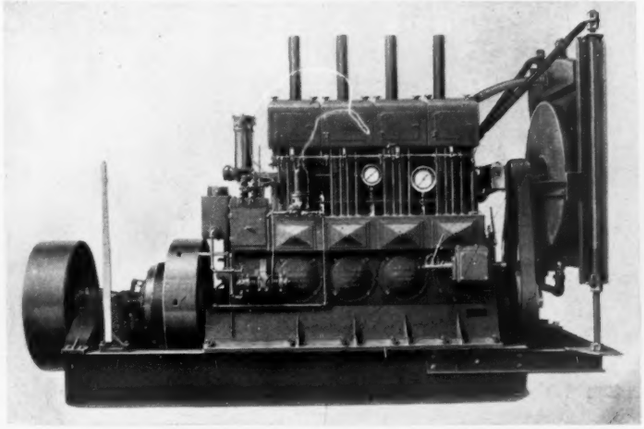


Fig. 3. Diesel engine with auxiliaries built in for use in tractors and power shovels

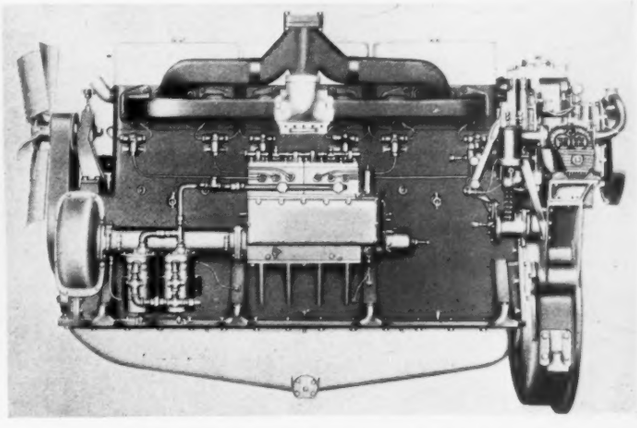


Fig. 5. Four-cycle type of Diesel suitable for various industrial purposes

duty gasoline engine, and are quite similar in operation, being both two and four-cycle, and with rotative speeds as high as 2000 r.p.m. not unusual.

Representative Types

An engine used for some years by several equipment builders is shown in Fig. 3, the Atlas-Imperial Diesel, 4-cylinder, 7x8½-in., tractor type for shovels and tractors, hoisting cranes and locomotives—one of the pioneers in the field. It is of the four-cycle, solid injection type, usually radiator cooled and has most of the auxiliaries built in, together with suitable clutches, or is direct-connected to generators; therefore, it has been practically and successfully applied with both mechanical and electrical transmission, having a rotative speed range from 600 to 650 r.p.m., and a net weight of scarcely 50 lb. per horsepower. This is known as the road builders' portable model. A modification of this engine for application in trucks and other mobile equipment is shown in Fig. 4, which is fully inclosed and protected against dust and damage to working parts.

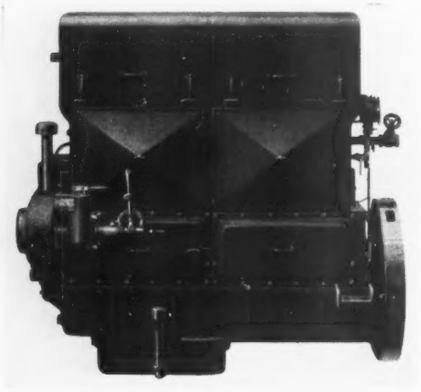


Fig. 4. Modified design of engine shown in Fig. 3, applicable for mobile equipment such as trucks

Another engine familiar to the rock products industries is the Buda M. A. N., four-cycle (Fig. 5), combining both foreign and domestic design features, and built in suitable sizes for industrial locomotive, shovel and dragline work. An important and useful application is shown in Fig. 6, the layout of a Plymouth 15-ton locomotive, the engine being rated at 91 hp. The drive is a mechanical clutch and gear drive.

Fig. 7 shows a Whitcomb locomotive with a similar method of applying the Fairbanks-Morse, two-cycle, high-speed engine. One of the first buyers of the Diesel-equipped machine was the well-known firm of A. Guthrie and Co., St. Paul, Minn., who bought three 20-ton machines of this type equipped with Diesels.

The product of another leading Diesel-engine builder to pioneer the high-speed, portable type engine for shovels is shown in Fig. 8, built by Fulton Iron Works.

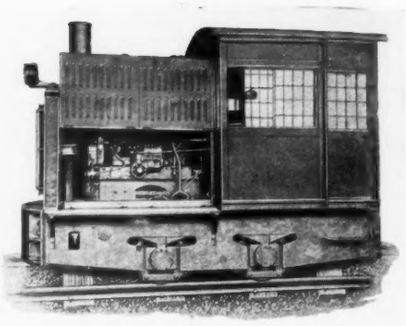


Fig. 7. A 12-ton industrial locomotive powered by a two-cycle high-speed Diesel engine

This is also the fully inclosed type, en-bloc construction, solid injection, with radiator, transmission and various built-in features.

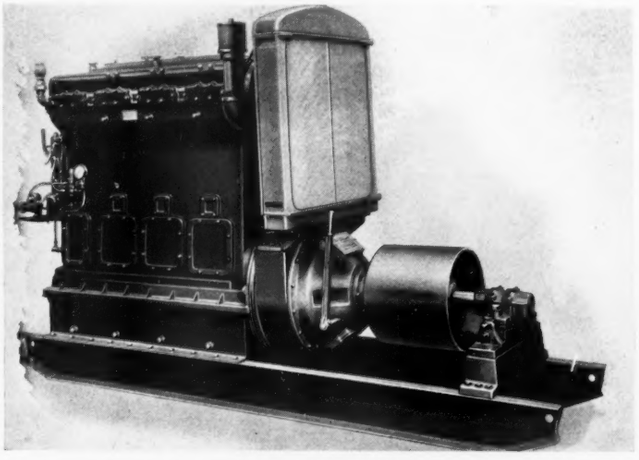


Fig. 8. High-speed Diesel engine for power shovels

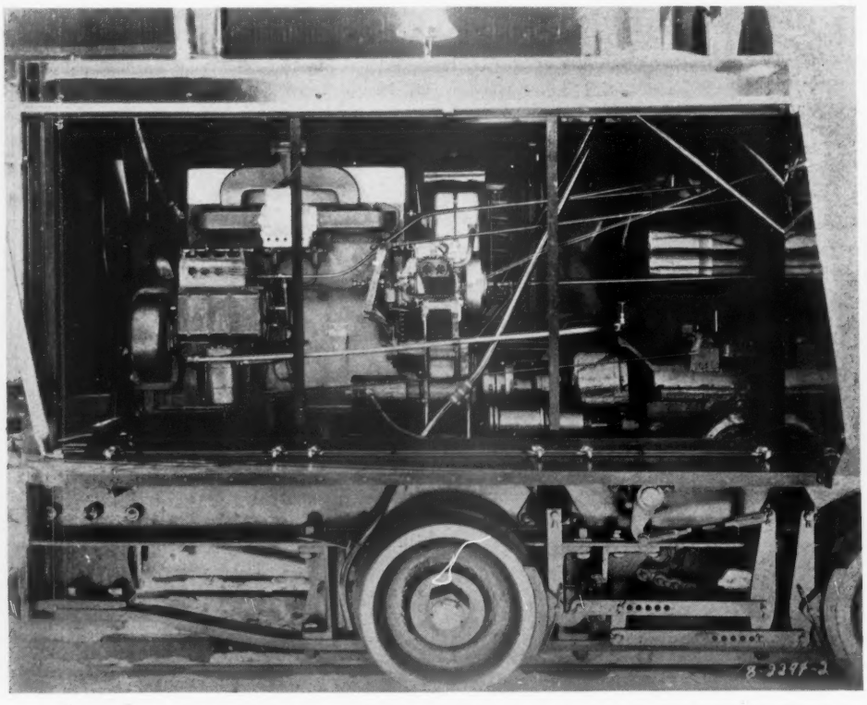


Fig. 6. A 15-ton locomotive powered by Diesel engine of type shown in Fig. 5

Typical Designs

Figs. 9 and 10 show the cross-sectional views of two engines which are typical of the type and design of high-speed, small Diesel engines. In Fig. 9 is a detailed description of the Buda M. A. N. engine.

The best engineering design, the most advanced metallurgical and foundry practice, as well as machining operations is found in these modern Diesel engines; and these are necessary factors to their success. The perfection of injection methods, a development now in prospect but as yet unattained, in the present type Diesel, is already of less importance than the design, construction and workmanship. These are necessary to the attainment of the operating satisfaction, reliability and dependability, economy and long life that is associated with these machines, and are established characteristics they have in common.

Commercial Applications

An interesting example of a Diesel-powered shovel is shown in Fig. 11, a Lima 101, owned by the Marble Cliff Quarries Co., Columbus, Ohio. This machine is powered

by a Buda M. A. N. Diesel, and according to H. R. Welch, superintendent, is economical, and easy to handle. This same machine operating as a dragline is shown in Fig. 12, used by Theisen Brothers, Osmond, Neb. Reports show that these machines have been successful in quarry work and economical to operate.

The shovels and draglines made by the Marion Steam Shovel Co. are similarly equipped for this work. Figs. 13 and 14 show the type 450 and its power plant, a Buda 91-hp. engine, while Figs. 15 and 16 show the 2-yd. shovel and the Winton 150-hp. engine. These applications are the Diesel-electrical-transmission type.

The engines are direct-connected to a direct-current generator and operate the machine as an electric machine. Fig. 17 is a closeup view of the recently developed 150-hp. Winton Diesel, showing the method of mounting and connection to the generator. While this is a 6-cylinder, 4-cycle engine, it is mounted on a very rigid base and unusually free from objectionable vibrations.

An example of the mounting and layout with mechanical transmission is shown in Figs. 18 and 19 of the Fulton engine in a shovel application It may be noted that the engine is operated by remote controls near the levers for operating the hoist.

The work of stripping overburden with a shovel and dragline, or the use of shovels for excavation for roads through rocky soils calls for the most exacting type of power plant. The frequent encounter of obstructions so difficult of removal as to stall a gasoline engine really demonstrates the ability of

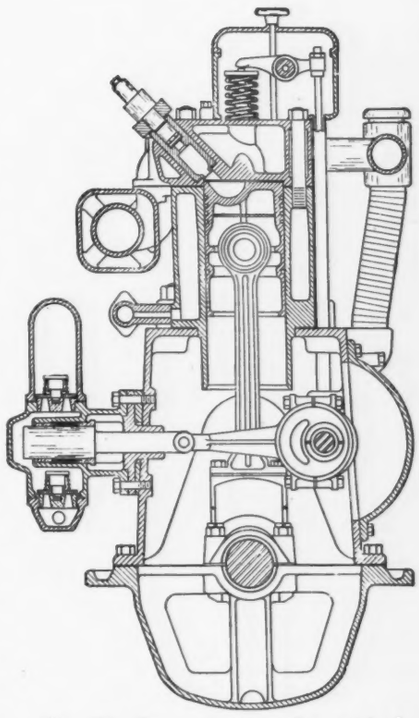


Fig. 10. Cross section of a typical high-speed Diesel engine

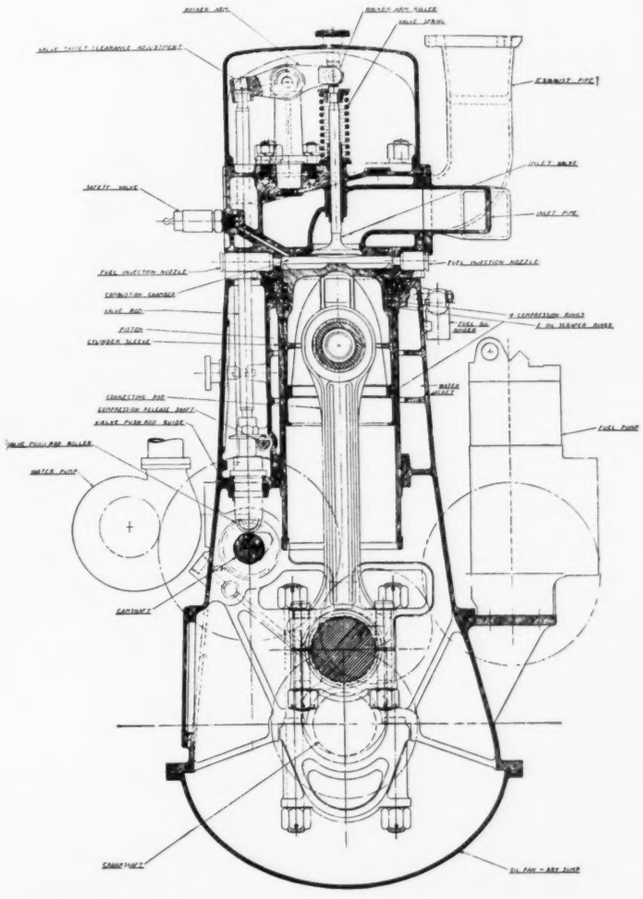


Fig. 9. Cross section of high-speed, small Diesel engine showing details of construction and operation principle

TABLE III. DIESEL EFFICIENCY IN LOCOMOTIVE TRACTIVE EFFECT

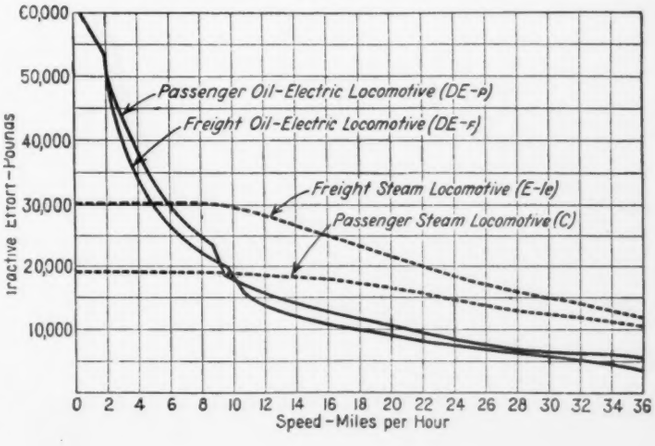


Fig. 11. Diesel-powered shovel at an Ohio quarry

Fig. 12. The same machine as in Fig. 11 operating as a dragline

Fig. 13. Diesel-electric shovel operated by 91-hp. Diesel engine

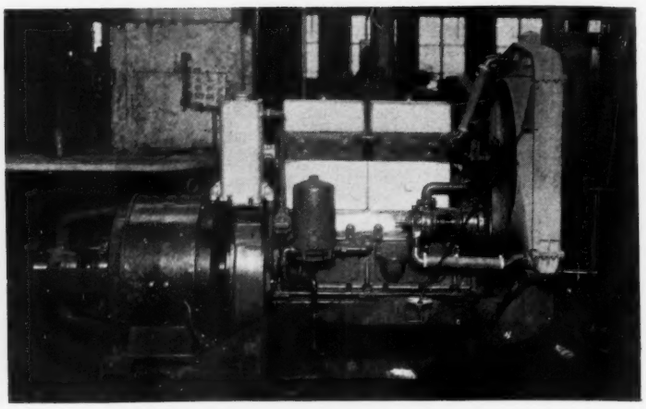


Fig. 14. Power plant for shovel (Fig. 13)

the Diesel "to get it" without breaking down, or stalling. Even at low speeds, the pick-up is unusual. Such work as shown in Fig. 20, excavating rock from a logging road in Washington with a Bucyrus-Erie, Diesel, high-lift shovel, has shown this characteristic of the Diesel to be an established fact. This same type of machine operating as a dragline stripping overburden is shown in Fig. 21, a similar test of the ability of the Diesel for power and loading.

Locomotives and Diesels

The history of locomotive application of the Diesel engine has been no less interesting. Several years ago the manufacturers of the Plymouth, Whitcomb and other industrial locomotives started to use high-speed Diesels, and today these companies have a great many installations in the field giving very good account of themselves.

Fig. 15. A 2-cu. yd. Diesel-electric shovel typical of those in use at some quarries

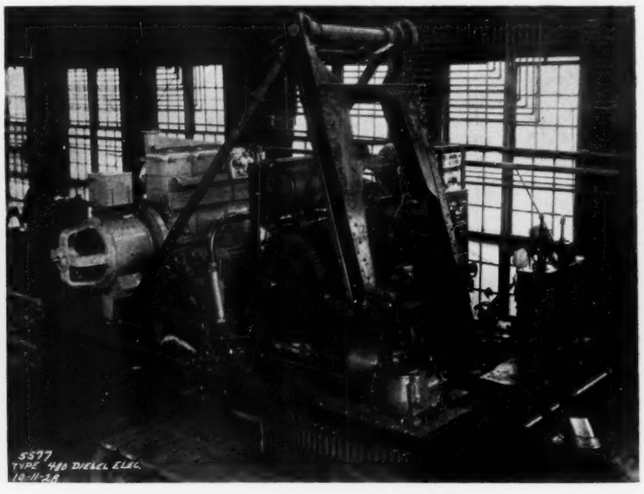


Fig. 16. Interior view of shovel (Fig. 15) showing the 150-hp. Diesel

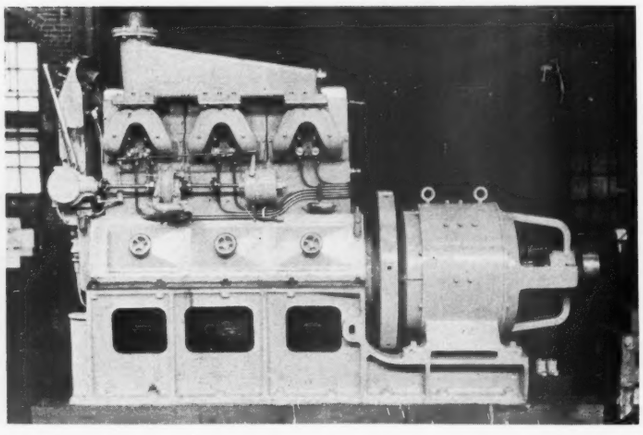


Fig. 17. Close-up of recently developed 150-hp. Diesel engine showing the method of mounting and connecting to generator

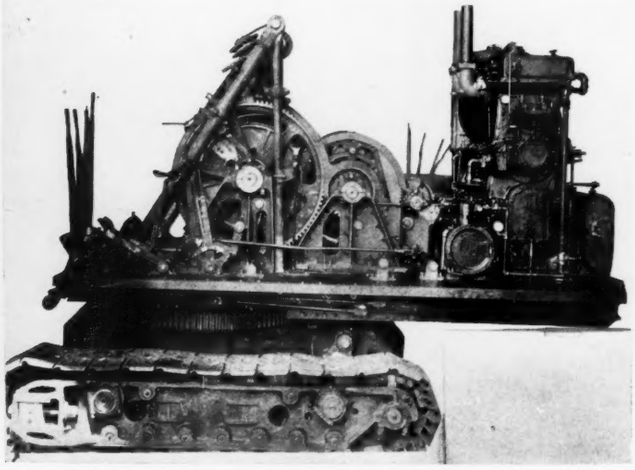


Fig. 18. Illustrating the method of mounting and layout with mechanical transmission in a power shovel

A typical installation, Fig. 23, is one of three 10-ton locomotives placed in service at the Livermore (Calif.) gravel plant of the Kaiser Paving Co., a Plymouth machine equipped with an Atlas Imperial developing 70 hp. at 600 r.p.m., a four-cycle, four-cylinder 6½x8½-in. Diesel. These engines haul a train of eight cars a distance of 1¼ miles from the gravel pit to the plant. Part of the grade is 3%, but the success of the Diesel locomotives proved that the horsepower was ample and the engines capable of considerable overload.

Because of the high torque developed by the Diesel engine when operating at slow speeds these locomotives demonstrated a remarkable ability to start and haul over long, severe grades—much greater loads than a gasoline locomotive of the same size and horsepower—and the increase in hauling capacity over any other type of locomotive was still greater than the increase over the gasoline locomotive.

These three locomotives have been in service more than three years, operating part of the time 24 hours a day and have shown high operating efficiency, low maintenance costs and a very low cost for fuel.

The next development was a 30-ton locomotive of the 6-wheel type equipped with an Atlas Imperial 6-cylinder, 7½x10½-in. Diesel developing 155 hp. at 500 r.p.m. Two of these machines, Fig. 24, are in service at quarries in California operated by the Calvareras Portland Cement Co. and the Monolith Portland Cement Co. (Fig. 25). In both of these installations the work consists of hauling rock from the quarry to the mill, while the hauling of cars in the quarries is handled by similar Plymouth gasoline locomotives.

A similar test for a 30-ton locomotive so equipped is on a 10-mile spur track from the stone quarries at Chestatee, Ga., connecting with the Gainesville and Northwestern railroad. Two 30-ton Diesel locomotives replaced on this job an 80-ton steam locomotive. Two 30-ton Diesel locomotives were coupled together and operated as a single locomotive by one operator in each locomotive cab, using exactly the same engine crew as the steam locomotive. The haulage of this rock is up a 3% grade, but despite this fact the combined Diesel locomotives hauled one more car than the steam locomotive and showed considerable saving in fuel and repair costs.

Plymouth locomotives have been developed in sizes up to 60 tons and larger using Diesel engines, and some light higher speed machines have been developed using the Buda M. A. N. Diesel operating at higher speeds. The regular line of locomotives is now built in a range of sizes from 10 to 60 tons, in 4-, 6- and 8-wheel types and driven either with a 4-speed gear transmission or electrically with generators direct-connected to the engines, and separate motors geared to each of the axles. One of these layouts is shown in the views herewith.

Figs. 26 and 27 show the application of a Fairbanks-Morse high speed Diesel in the Whitcomb locomotive. Fig. 28 is an interesting view of the application in a quarry of the New York Trap Rock Co. The transmission is mechanical through gears, employing the Whitcomb company's own clutch and drive, which shows very satisfactory operation for the Diesel-type locomotive. This company also builds an oil-electric type machine.

Fig. 19. End view of shovel (Fig. 18)

Concurrent with the development of industrial locomotive application, larger machines for regular railroad transportation work have been developed in recent years. The leading railroads of the eastern seaboard are using such machines, particularly in switching service. Such machines are built up to 2000 and 3000 hp.

Any discussion of the Diesel engine al-

Fig. 20. A Diesel shovel used in opening a logging road in Washington

Fig. 21. Shovel shown in Fig. 20 converted to dragline for stripping

Fig. 23. A typical Diesel-operated 12-ton locomotive in use at a gravel plant

Fig. 24. A 30-ton locomotive of the 6-wheel type equipped with a 155-hp. Diesel engine

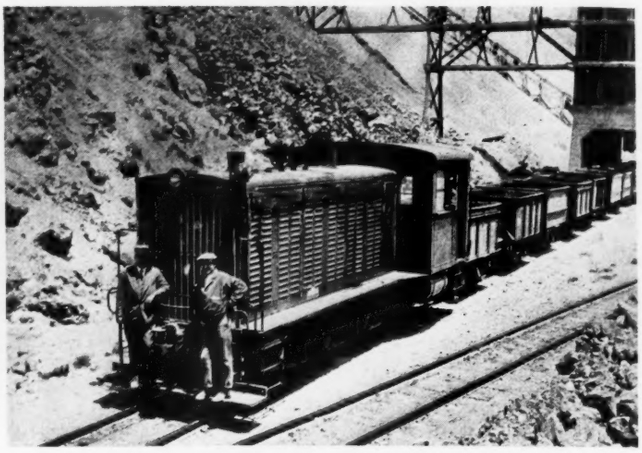


Fig. 25. Another 30-ton locomotive similar to that shown in Fig. 24, in use at a California cement quarry

ways provokes the question as to just what is a Diesel and how does it operate. The principle is quite simple. It is first an internal combustion engine, meaning that it burns directly in the cylinder liquid fuels. They must be heavy fuels of high boiling points.

The next point is that it requires no carburetor, hot points, heating torches, electric plugs or any other heated device to initiate ignition. No electricity is used in connection with its operation. The Diesel principle is the ignition of the fuel by the heat of compression only.

Precisely; the cylinder is filled with pure air, which is compressed by the upward travel of the piston, and as a result the air becomes highly heated by the time the piston reaches upper dead center. At or near the finish of the compression stroke fuel is sprayed into the cylinder in a finely atomized state. When ignited by the highly heated and compressed air the burning fuel produces by virtue of expansion a power-creating force which drives the piston downward on the power stroke.

The fuel is sprayed into the cylinder at a graduated rate, consequently ignition and combustion takes place gradually without explosive violence, and it is this prolonged ignition and expansion that makes for such high thermal efficiency of the Diesel.

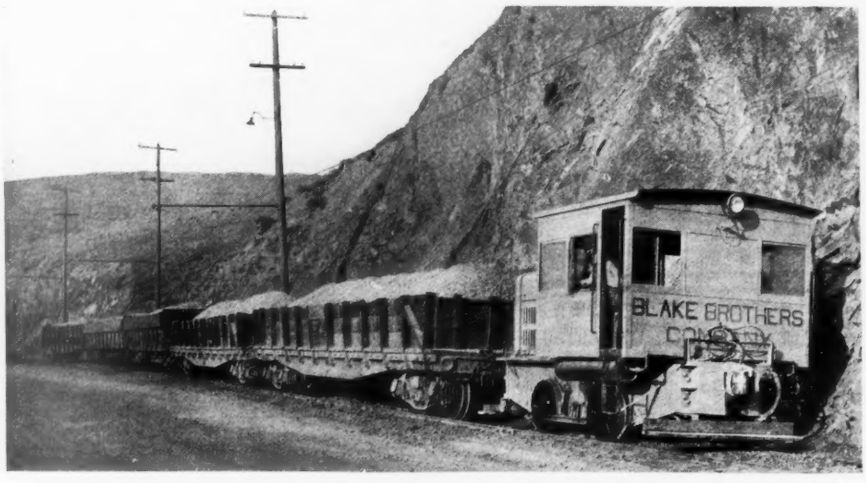


Fig. 26. A 20-ton Diesel locomotive operating at a quarry

Historical Record

Long before the earliest steam engines scientists knew the possibilities of power by the explosion of gunpowder in a closed vessel, and the Huyghens engine based on the gunpowder idea was actually built in 1680. The idea of an internal combustion engine, however, remained dormant for centuries, practically speaking, and it was after the heyday of the steam engine before world-wide attention was again focused upon the internal combustion engine.

Present-day engineers are only now beginning to appreciate the possibilities of the old engine and to concede to this type of prime mover its rightful place in the scheme of power machines. Its history is, however, one of many discouragements, many failures and trials. Unreliability more than any other factor contributed to the early discouragements. Defects in construction defeated the best efforts of early engine builders, and only after much research in metals and chemistry did the internal combustion engine as we moderns know it arrive. A memorial to these pioneers is the commercial Diesel of today, highly perfected and widely used, because of its economy and reliability.

The entire history lies between this remarkable engine of today and Lenoir's engine, the first commercial engine to be placed on the market. It had an efficiency of less

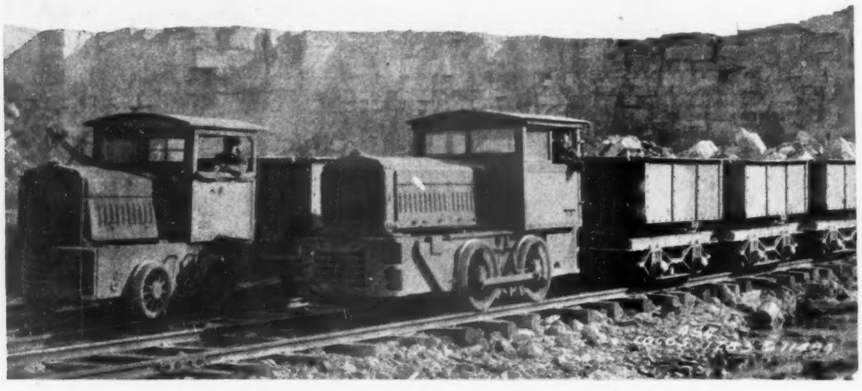


Fig. 27. Two Diesel-powered locomotives at an Illinois quarry

than 4%, yet hundreds were built and sold. The next to arrive was the Clerk engine, employing a separate charging cylinder, later many of them, operating on what we know today as the two-stroke cycle, built on the principle of using the crankcase to compress air and gas instead of a separate charging cylinder. The first four-cycle engine was suggested by Beau de Rochas, but never built, the idea later being improved by Otto, whose efforts brought forth the Otto silent engine, single-cylinder, horizontal, employing a sliding admission valve and a poppet exhaust, and first was shown at the Paris Exposition in 1878. Thus began the era of internal combustion engines.

So far these early engines were operated on the constant volume combustion, or explosions. The idea back of Diesel was born

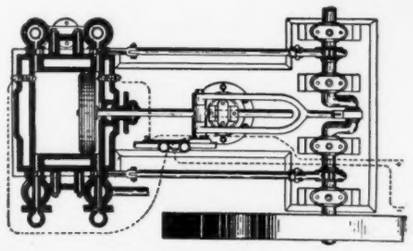


Fig. 29. Details of the first commercial internal combustion engine built by Lenoir

when Brayton in 1872 patented an engine which burned a gas-air mixture at constant pressure. While low compression and inefficient, it possibly suggested the next step, the Hornsby-Ackroyd engine, which instead of burning gas employed a liquid fuel.

The vaporization of the fuel into a combustible gas, that made possible the operation of this engine, was accomplished by injecting the oil into a hot chamber in the cylinder, where it was vaporized by the heat of previous combustions—a principle that remains in use to this day in the so-called "semi-Diesel" engine, thus pioneering the hot bulb, or surface-ignition engines as a class.

Many of these engines were in use and the subject of world-wide discussion at the time Dr. Rudolph Diesel, a German scientist, advanced the theory of a Diesel engine —largely a hypothetical calculation—on paper, an engine that would burn coal dust instead of oil. The cylinder air was to be compressed to such a pressure that the resulting temperature would ignite the coal

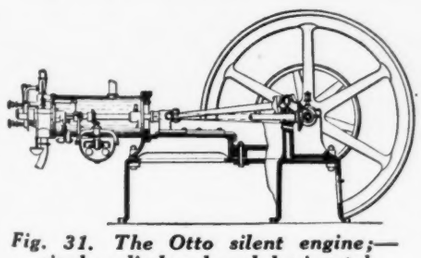


Fig. 31. The Otto silent engine;— single-cylindered and horizontal

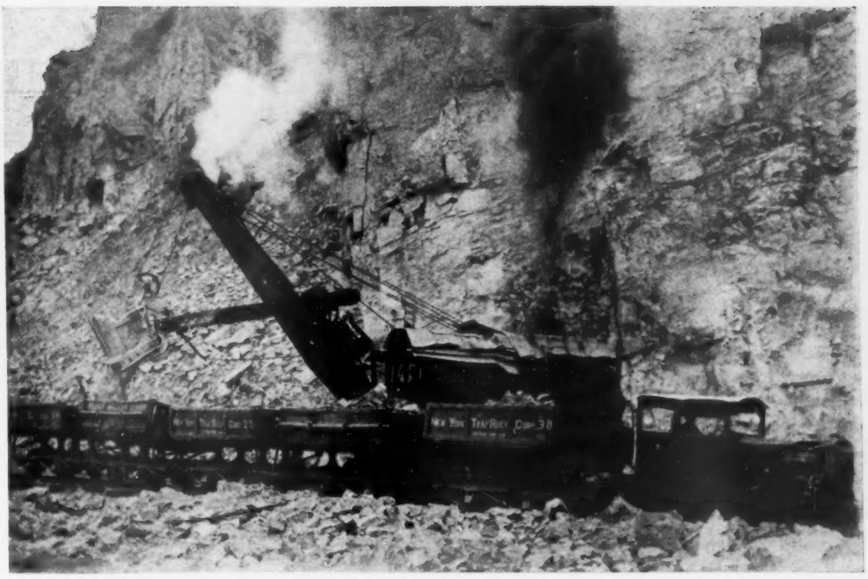


Fig 28. An interesting Diesel locomotive application in a New York quarry

dust. By controlling the combustion the heat developed was to equal the work done with no rise in temperature. Expansion was to be as a perfect gas, there being no losses, and no cooling water was to be required, and Dr. Diesel himself was said to have thought that the exhaust gases would be cooler than atmospheric temperature. Obviously this purely theoretical ideal has never been even

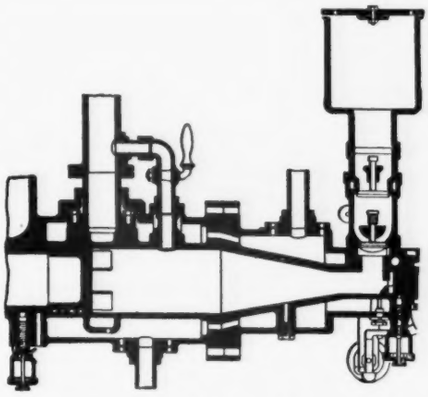


Fig. 30. The Clerk engine employed a separate charging cylinder

approached, but along about 35% of the length of this pathway traversed by Diesel's flight of fancy toward practically an imaginary goal the Diesel as we know it was found. Then came a modification of the coal-dust engine, using oil but retaining Diesel's idea of prolonged and controlled combustion by regulating the time of injection over a period of time by gradually introducing the fuel. Thus the Diesel was fully born, and during the period of the first patents little progress was made other than the foundation in experimental engines and at least one American example of a successful engine—the Busch-Sulzer engine. Following the expiration of the Diesel patents in this country in 1912, the production of Diesel engines and its modifications set in rapidly and in earnest. It is said that between 2,000,000 and 3,000,000 hp. was developed the first 10 years, either of the full Diesel or semi-Diesel type; and less than 1% of this power has been scrapped.

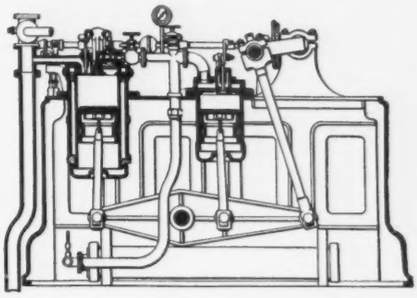


Fig. 32. The Brayton engine burning a gas-air mixture at constant pressure was the basis for the Diesel engine

Despite this tremendous increase, the Diesel engine is still in its infancy so far as its immediate future possibilities are concerned. In the last five years application of high-speed portable types has increased by leaps and bounds, and the development of practical commercial types for automobiles and airplanes suggests an unlimited application in new ways.

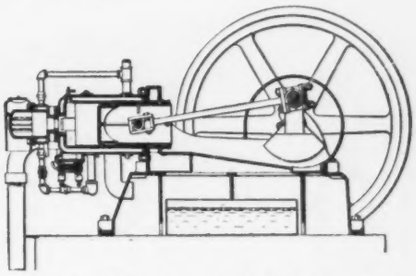


Fig. 33. The Hornsby-Ackroyd engine, the first to use a liquid fuel

Preparing Clean Stone From a Former Waste Product

Washing Plant of Bethlehem Mines Corp. at Naginey, Penn.

IN THE JULY 6, 1929, issue of ROCK PRODUCTS, a description of the new limestone flux plant of the Bethlehem Mines Corp. at Naginey, Penn., reference was made to the commercial stone plant to be built, so as to put in marketable shape the minus 2¾-in. material from the two rotary screens.

At that time the 2¾-in. and finer material was being stockpiled and a large tonnage of material practically wasted, much of which was entirely suitable for concrete aggregate when properly cleaned. It was estimated that about 20% of the total tonnage taken from the quarry was unsuitable for fluxing stone, on account of its small size and clay content.

During the summer months the washing plant described here was added. The addition of this required no alterations of any consequence in the flux-stone part of the plant, although the quarry has been lengthened approximately an additional 1000 ft.

The washing plant, as it now stands, can handle 35 tons per hour, leaving, roughly, an hourly tonnage of 25 tons that still goes to the dump, but when market conditions warrant it, will be put through the washing plant, parts of which will be enlarged so as to take care of the entire tonnage of minus 2¾-in. material, as well as to reclaim some of the material already on the dump.

The company at first expected to sell its products through a local aggregate producer, but later decided to handle the sales through its own organization. J. F. Tyson has been placed in charge of the sales of commercial stone from this new venture of the Bethlehem Mines Corp.

The deposit has a variable amount of clay overburden which formerly had been cast back as far as possible from the quarry rim and stacked in windrows. This material is now being loaded by a ¾-yd. Erie, Model B, steam shovel on crawler treads to trucks and hauled sufficiently far back from the face as to be permanently disposed of. The company has a 5-ton Mack and a 5-ton International truck for this work. A 1½-ton Ford truck is also used on the stripping at times.

A 23-Ft. Double-Log Washer

The stripping, being a clay, adheres to the stone with a tenacity that precludes the possibility of removal by ordinary rotary-steam washing methods, so to insure a clean aggregate a 23-ft. McLanahan log washer was installed. This gives the stone a thorough scouring, loosening the clay so that the water sprays at the discharge end of the log washer, and on the vibrating screens used for subsequent sizing, serve as rinsing waters, giving a clean stone, free from clay, and a stone that easily meets all the exacting requirements for aggregate for highways.

The minus 2¾-in. material rejected by the fluxing plant's rotary screens falls to bins from which steel, hopper-like chutes deliver the material to a 20-in. Robins belt conveyor using a Goodyear belt. Flow control is by two reciprocating pan feeders under the hoppers. The 20-in. belt has a center-to-center length of 211 ft. and elevates the material through an 18-deg. angle to the top of the new washing plant, discharging to the low end of the log washer. The washer is inclined at an angle of about 7 deg., and the stone discharges at the high

Stripping the clayey overburden at the quarry

end. At that point are located four water sprays that deliver all the water that is used to the log washer. The amount of water used will run between 200 and 300 gal. per min., depending on the amount of clay adhering to the stone.

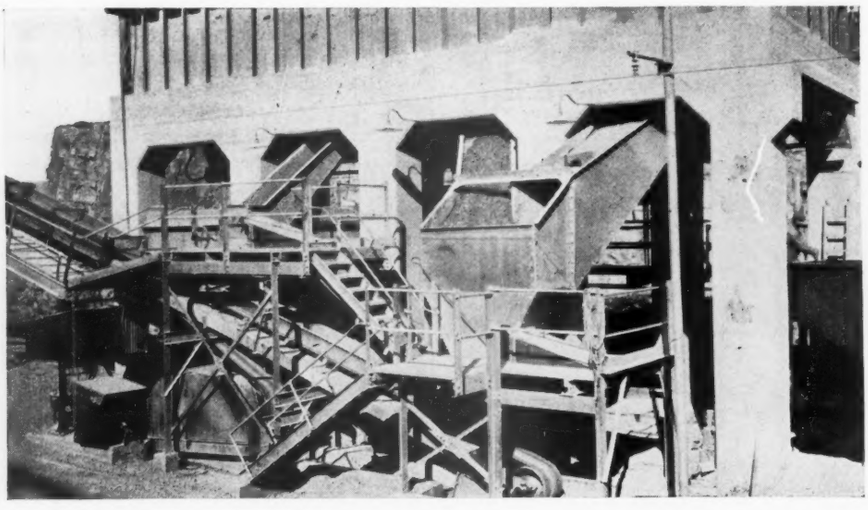
Water at present is purchased, and consequently no more is used than is necessary to give a clean stone. Later water will be pumped from a small stream below the plant.

Screening

The stone from the log washer falls to a double-deck 48-in. by 102-in. Robins "Gyrex" screen, having a 1-in. mesh top size and a ½-in. mesh screen on its lower deck. The oversize from the two decks falls to separate bins and is referred to as 2¾- to 1-in. and 1 to ½-in. stone.

The fines from the lower deck fall to a short belt conveyor and are delivered to a single-deck 48-in. by 102-in. Gyrex screen having 0.185-in. openings (approximately 5-mesh). The double-deck screen is said to have a capacity of 150 tons per hour and the single-deck 40 tons per hour, so that when the plant is enlarged to take care of all the fines from the fluxing plant, additional screen area will not be necessary.

The oversize from the second vibrating screen produces a ½-in. to 0.185-in. prod-



Fines from the fluxstone plant are stored in bins and withdrawn as needed through hopper chutes. The chutes feed to reciprocating pan feeders delivering to the conveyor of the new washing plant

Screening plant for limestone flux with the new aggregate plant in the background

The new aggregate plant showing the log washers and screens mounted over the bins

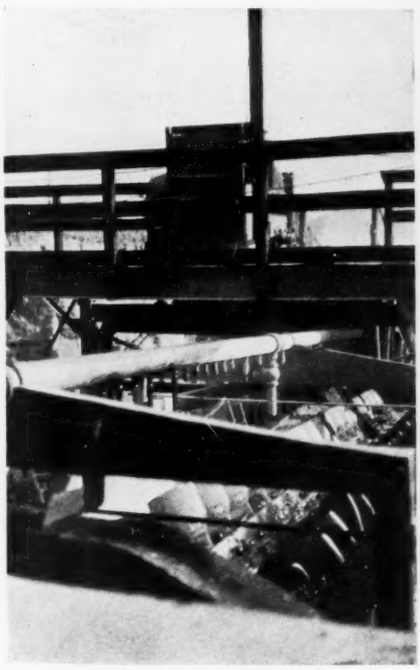
uct, and the fines, which fall to separate bins. The fine stone or sand is not further classified. Contents of the bins can be drawn direct to cars or trucks.

Only one man is required to operate the washing plant and to load the cars.

Power Requirements

A total of 119 hp. is required to run the plant, with all the motors in permanent housings, direct connected to the various units through enclosed gear reduction units; 75 hp. is required to run the log washer at 13 r.p.m. Following is the motor schedule, totalling 119 hp., for the entire plant:

Log washer	75 hp.
20-in. belt conveyor	25 hp.
No. 2 belt conveyor	3 hp.
Feeder No. 1	3 hp.
Feeder No. 2	3 hp.
Double-deck screen	5 hp.
Single-deck screen	5 hp.



A section of the 23-ft. double-log washer

Water sprays at the discharge end of the log washer

Canadian Road Materials

ANOTHER of the Canadian Mines Branch Investigations, No. 697, dealing with the ceramics and road materials in Prince Edward Island and the quarries of Quebec, has been recently brought out by Canadian Department of Mines, Ottawa, Ont. The report gives brief details of the visit made to 13 stone quarries in the province of Quebec, in districts not covered by the field work of previous years. Most of these quarries are not worked for the production of road metal.

A detailed investigation of the road material resources of the province, which consisted of prospecting for materials suitable for road construction is given.

E. R. Wash, superintendent, Naginey plant, Bethlehem Mines Corp.

The Spray Process of Slurry Feed*

By S. J. M. Auld, O.B.E., M.C., D.Sc.

THE cement industry being largely dependent on the efficient use of fuel, it is natural that the study of heat transfer phenomena should be the basis for the design of much of its important equipment. In this matter, as reflected by fuel consumption, the change from the dry process to the wet process has been retrogressive; nevertheless, the unquestioned advantage of the wet process in facilitating intimate mixing of the slurry and the correct proportioning and control of the ingredients has so far generally outweighed other considerations as to render the dry process obsolescent. With the advent of the wet process, fuel consumption so far increased that in kilns of stated fuel capacity the reduction in output (with the old methods of slurry feed) can be taken to be at least 10% to 15% compared with that on the dry process for the same consumption. It is small wonder therefore that cement manufacturers have been working at least to make good this loss by decreasing the duty of the fuel, by recuperation and by better methods of heat transference. In the first two categories come the methods of the use of filters for the reduction of the water content of the slurry and the use of waste-heat boilers.

Heat Transfer

The matter of heat transference is rather more intricate. The evaporation of the water content of slurry and the subsequent clinkering are effected almost entirely by heat transference from gas to liquid and gas to solid. These cases are among the most difficult to follow theoretically. It can be shown, however, that better heat transference may be obtained by increasing the velocity or increasing the effective surface. In the cement industry the former may be regarded as nearly constant for each particular size of kiln with fixed fuel capacity. It therefore remains to increase the suitable area of heating surface. This is the underlying principle of all such methods as the use of lifters or chains for turning over the slurry, extra surface of which is thus exposed to the hot gases and extra solid surface provided to take up heat from the gases and pass it on indirectly.

Such methods are only a partial solution of the problem. The ideal method of heat transference is that automatically obtained between gas and gas or miscible liquid and liquid. As between gas and solids or liquids the nearest approach to this condition of things is to be got by fine subdivision, and the optimum obtainable in cement making is by "atomizing" or spraying the slurry into the kiln.

Slurry Spraying

The method of slurry spraying is therefore fundamentally sound and is, indeed, nearly theoretically perfect for the type of heat transference under consideration. It has remained to develop it in such a way as to render it equally sound in practice, and this has been accomplished by the process evolved by the late Thomas Rigby and brought to a state of mechanical efficiency by the inventor and his associates.

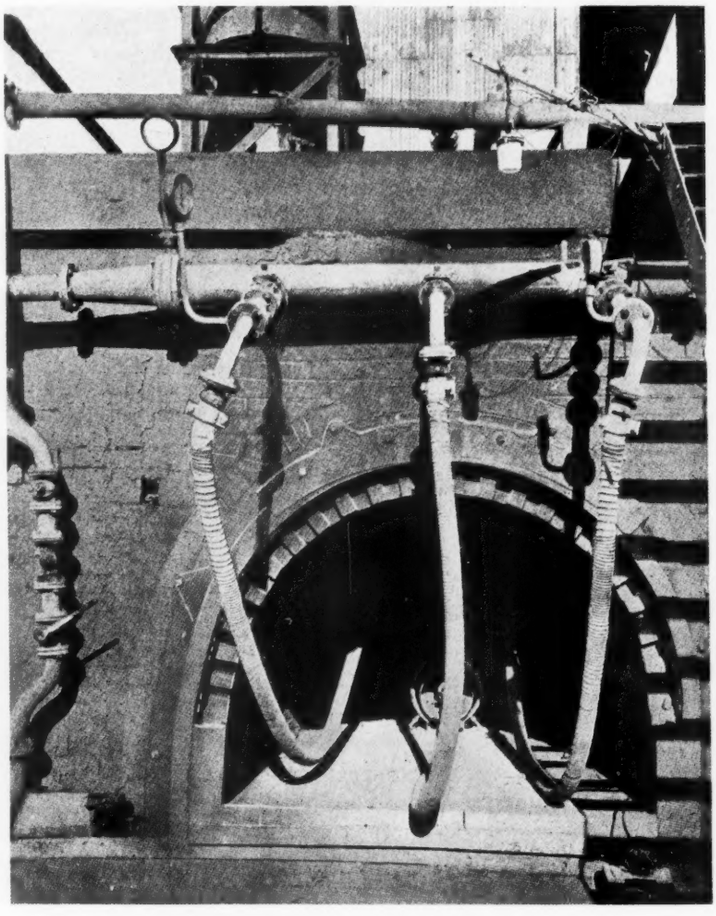
The process and its method of use are being developed by the Industrial Driers, Ltd., of London. Remarkable results have been achieved by the Rigby process and, with earlier mechanical difficulties overcome, the process is being increasingly adopted throughout the world.

Features of Rigby Process

The underlying features of the Rigby process are: *(a)* the spraying of the slurry down the length of the kiln in counterflow to the ascending hot gases; *(b)* the use of directional control of the spray so that the evaporation is so far completed before the slurry touches the walls that there is little or no adherence, and therefore a reduced tendency to build up slurry rings; and *(c)* the use of a slurry lute in the smoke chamber for the collection of dried or partially dried slurry deposited from the spray or carried over from the kiln.

Not only is the trouble from slurry rings minimized and in most cases entirely obviated, but the dry meal and the clinker are generally of smaller size than those produced from the same materials by part methods, the clinker at one works on test with the process being reduced to a coarse powder with about 80% capable of passing a ⅛-in. screen.

The process can be varied slightly according to the nature of the slurry and the size of the kiln, but as a rule two cones of spray are produced, the direction of which can be



Slurry spray system at a modern English portland cement mill

*Cement and Cement Manufacture, November, 1929.

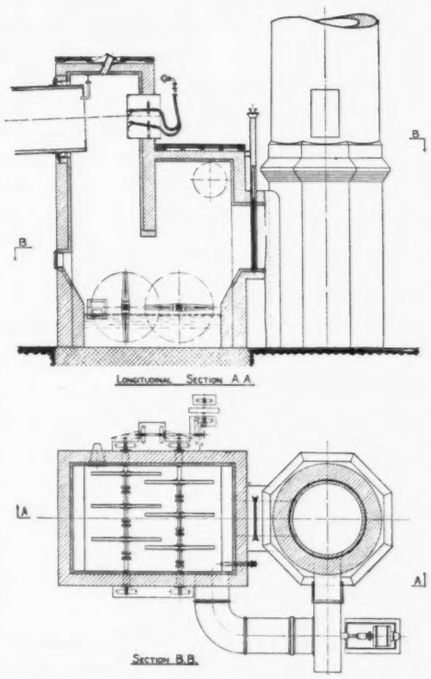
adjusted and the relative pressure modified so as to give interlacing zones distributed along the kiln, thus effectively interposing a double barrage of slurry spray across the path of the hot gases. When a single spray is used it is adjusted, as regards spread and distance from the kiln-mouth, to produce as effective a spray screen as possible. When the double spray is employed the pressure on one jet is kept around 70 lb. per sq. in. and the other at a few pounds less. By these means the most intimate contact is obtained between slurry and hot gases, and evaporation proceeds efficiently. At the same time the slurry spray arrests and washes down dust which would otherwise be carried out through the stack, and in this way mitigates the dust nuisance.

In practice the slurry is passed through a Clarke separator or similar device to insure efficient removal of large particles which might interfere with the proper flow of the slurry or the shape and direction of the sprays. The cleaned slurry is then delivered by suitable pumps through strong flex to the nozzles. Ram pumps are generally used for the purpose, but there is no reason why centrifugal pumps should not be employed, and in one or two works where the process has been recently installed this is being done with good results.

Experience has shown that the feed pressure is best hand-governed by a pressure-control valve, excess slurry being returned either to the feed tank or the main slurry tank. The nozzles are mounted in a steel plate forming part of a housing projecting from the anterior wall of the smoke chamber, the slurry being sprayed as a rule across part of the passage conveying the gases from the cold end of the kiln. The nozzles are of simple construction without moving parts and require very little attention, the only parts which wear out being the tips and to a lesser extent the spiral guides which may be employed to give direction and a rotary motion to the spray.

The nozzle tips can be made of various materials. Mild steel, case hardened, is largely used and this lasts on an average 70 hours. White cast iron is also extensively employed, particularly on the Continent, where it is regarded more favorably than case-hardened mild steel, and such tips are claimed by several works to last 100 to 120 hours. In the United Kingdom one firm uses a specially hard proprietary steel and these tips last at least 300 hours. The cost of the tips is inconsiderable and replacement can be made in a minute or two, so that there is no stoppage of the kiln or interference with output. The tips are replaced, or may be bushed, when observation indicates that wear has proceeded sufficiently to cause the spray to waver in its course when issuing from the jet. The spiral guides need only be replaced every two or three months, and other parts of the nozzle last indefinitely.

The chief advantages of the Rigby spray-feed process are claimed to be increased output or decreased fuel consumption, or both, and it is on this basis that claims for its revolutionary character are based. The actual extent of fuel economy or increased



Details of a slurry spraying installation

output depends on such factors as the nature and the water-content of the slurry, the calorific value and efficiency of combustion of the fuel, the size and nature of construction of the kiln, etc. Estimation of the benefit to be anticipated can therefore only be made for each individual case as a result of consideration of the existing conditions of operation.

Reduced Coal Consumption

In practice the reduction in coal consumption, calculated per unit weight of cement, varies as a rule from 15% to 20% and the increased output per kiln from 20% to 30%. In the following cases, taken from a list of works operating the process, the results achieved have been as follows:

Works	Country	Water content of slurry	Reduction of fuel consumption	Increased output per kiln
A	United K'gd'm...	40%	20%	25–30%
B	Belgium.....	42–43	20	25
C	Scandinavia.....	38	....	23–27
D	Poland.....	37	....	25
E	Australia.....	40	....	19

These results support the claims made for the outstanding nature of the spray process. Further, the operating and maintenance costs are low and do not appreciably affect the net saving. As regards maintenance, the only working parts likely to suffer wear apart from ordinary depreciation are the nozzle tips and guides already mentioned and the slow wear from abrasion of the perforated separator plates and pump packings, the cost of replacement of which is negligible. The total maintenance costs are stated to be less than 1/20 of a penny (1 mill) per bbl.

It is not necessary to employ extra labor, the kiln men being capable of operating the process as part of their routine. It is, of course, advantageous to put control of the atomizing in the hands of one man, who, however, can perform other duties.

Installation Costs

In the case of new plants the capital cost is inconsiderable. For existing plants the modification of the smoke chamber forms the largest outlay, consisting of minor structural alterations to permit of the installation of the spraying assembly and the deflection of the kiln gases over the slurry lute and the installation of a fan to make up for the loss of draught occasioned by the cooling of the exit gases in the spray process. The cost of structural alteration varies with each installation, but is seldom more than a few hundred pounds. This, of course, does not include new plant, i. e., atomizing and paddle gear, fan and motor.

The size of the fan is calculated for each individual case, but it should be pointed out that the fan duty is to make up for the drop in temperature, there being little or no resistance from the spray to the flow of gases. Powerful fans such as are used for waste-heat boilers are not needed. The temperature of the exit gases measured at the entrance to the smoke chamber is considerably reduced by the spray process, generally by 200 deg. C. to 250 deg. C., but owing to the difficulty of obtaining strictly comparable observations the actual temperature is not a good criterion of the efficiency of operation.

The slurry lute, which is an important feature of the Industrial Driers spray installations, is also covered by world-wide patents. It consists essentially of a volume of slurry in the bottom of the smoke chamber, kept agitated by paddles set in counter rotation and combined with means for the deflection of the kiln exit gases over its surface. By this means all deposits from the jets and any dust carried away from the kiln are washed down into the slurry, which passes continually over a constant-level weir and is thence conveyed to the slurry tank or direct to the kiln for re-use.

The slurry lute is of particular value when powdery raw materials are employed. It practically eliminates the dust trouble arising from the use of rotary kilns, and as such is of vital importance in reducing loss and ameliorating conditions where accumulation of flue dust or its distribution over the neighboring country constitutes a nuisance. In very severe cases arrangements are also made for spraying slurry into the smoke chamber, but it is only in rare instances that this added washing has been found necessary.

Power Consumption

On this basis it is possible to sum up the power consumption for an average works

using the spray process, though it will naturally vary with the size of the plant. About 15 hp. is required for the ram pumps, 6 hp. for the paddles, 15 hp. for the fan and 2 hp. for the separator when used. With power at one halfpenny (1 c.) per unit the total operating and maintenance charges come well under 2d. (4 c.) per ton. The saving in fuel alone is very considerable. The reduction of operating costs has in itself been sufficient to induce certain cement manufacturers to make the change, while to others the chief attraction has been the possibility of increasing output with limited expenditure since it is possible readily to modernize existing rotary kilns by the use of this method. In new works designed for a given capacity the length of the kiln could be considerably shorter with the atomizing process than with the older feed methods. This not only lowers capital charges by reducing the length and height of the kiln houses but effects saving in the power required for rotating the kiln. On the average kiln it is claimed the length could be reduced by approximately 20%.

As compared with the use of chains alone the spraying process is claimed to give much better heat transference and to allay the dust trouble.

A great additional advantage to the spray process is the reduced wear on the kiln lining. In one case the life of the kiln lining has been increased over five times by its introduction, and this saving alone is regarded as sufficient to repay the cost of installation.

The illustrations show respectively a diagrammatic layout of a spray installation and a photograph taken from modern works where all three kilns are working with the Rigby spray feed process.

Gypsum Containing Anhydrite for Retarding Set of Portland Cement

NATURALLY-OCCURRING anhydrite which corresponds chemically to gypsum without the latter's water of crystallization, has been known for a long time to have a very slow rate of solution in water; much slower than that of gypsum. Recent studies by the U. S. Bureau of Mines in co-operation with Rutgers University at New Brunswick, N. J., indicate that if naturally-occurring anhydrite is ground fine enough, its rate of solution is of the same order of magnitude as that of gypsum ground to the same degree of fineness.

A sample of anhydrite powder was subjected to air classification, and thereby separated into fractions of the following sizes distributions: 0—3 microns (1 micron= 1/25000 of 1 in.), 6—12 microns, 12—24 microns, etc. It was found that the finest fraction, that is, the 0—3 micron particles dissolved at such a rate that the saturation solubility of gypsum was reached in 3½ minutes. These results are of importance in any discussion of the utilization of gypsum containing large percentages of anhydrite for the retardation of the set of portland cement. If the rate of solution of the retarder is one of the controlling factors involved in the set of cement (and it seems probable that such is the case), then it would seem permissible to utilize gypsum containing a large percentage of anhydrite provided this retarder is ground to a sufficient degree of fineness.

Dredge Operating Costs

IN A recent issue of *Construction Methods*, C. T. Pearce, marine engineer for Westinghouse Electric and Manufacturing Co., presents data showing the comparative efficiencies and costs of operating steam-driven and Diesel-electric-driven dredges. He points out the desirability of having a d.c. motor on the suction pump, as the energy required to deliver a unit of solid material over a unit length of pipe is a minimum when the pipe line velocity is just sufficient to keep the solid material in suspension and varying the speed of the pump rotor is the most logical method of maintaining only sufficient pipe line velocity to attain that end. A Diesel-electric unit also has structural advantage over a steam-driven dredge unit having reductions in weight, better distribution of weights that tend to keep the boat in better trim and equipment can be mounted to better advantage, Mr. Pearce states.

Average fuel consumption for Diesel engines is given at 0.4 lb. of oil per horsepower as compared with approximately twice that figure for oil-fired reciprocating steam engines.

Comparative Records

Tables I and II give the results of a study which was conducted on operating costs of two 30-in. hydraulic dredges. On the steam dredge *Tualatin* the dredge pump was driven by twin 1000 hp. turbines, giving a total of 2000 hp., and on the *Clackamas* by a 2700 hp. d.c. motor. These dredges were both operated by the Port of Portland and performed an identical class of work except that the higher powered Diesel-electric dredge was used for pumping through longer pipe lines. In Table I the costs per cubic yard for the dredge *Clackamas* are, therefore, based on delivering the material through a longer pipe line. In order to designate a unit for use as a basis of comparison, the term transport unit is used in Table II. A transport unit is 1000 cu. yd. of material pumped through 100 ft. of pipe line, 1 ft. of net terminal lift being considered equivalent to 50 ft. of 30-in. pipe line. By transposing all dredge output to transport units the variation in pumping head between short and long pipe-line dredging is equalized for purposes of comparing costs. Fuel costs for both dredges are based on fuel oil at $1.30 per bbl. of 42 gal. The cost given do not include shore work, overhead, depreciation or interest charges and are only for comparative purposes between dredges.

TABLE II. ONE YEAR DREDGING RECORD OF "TUALATIN" AND "CLACKAMAS"

	"Tualatin"	"Clackamas"
Cu. yd. dredged	2,818,900	6,277,135
Net terminal lift, ft.	25.6	28.9
Pipe line length, ft.	3,973	4,808
Transport units	131,024	380,385
Total pumping hours	5,405	5,932
Total cost of operation	$221,784.43	$206,799.00
Cost per cu. yd.	$0.08	$0.03
Cost per transport unit	$1.69	$0.54
Cost per pump hp.-year	$110.89	$76.00

Ceramic Industry Survey

PENNSYLVANIA State College, State College, Penn., is collecting data on the production of ceramic raw materials and manufactured products within the state. Questionnaires have been sent out to all concerned and any data furnished will be incorporated (anonymously) in a reference book to be published. The co-operation of all producers within the state is requested.

TABLE I. AVERAGE OPERATING AND MAINTENANCE COSTS OF THE PORT OF PORTLAND'S 30-IN. HYDRAULIC PIPELINE DREDGES, "TUALATIN" AND "CLACKAMAS"

	Steam dredge "Tualatin" 810 operating days		Dredge "Clackamas" 623 operating days	
Performance:				
Rated pumps, hp.	2,000		2,700	
Cubic yards per operating day	10,980		19,720	
Average length of pipe line	3,224		5,126	
Average lift of discharge	25		25	
Operation:	Per day	Per cu. yd.	Per day	Per cu. yd.
Labor (operating)	$181.58	$0.01654	$187.73	$0.00952
Fuel and water	287.34	.02617	104.09	.00532
Engineering department supplies	6.25	.00057	40.90	.00207
Deck and miscellaneous supplies	6.09	.00055	9.17	.00046
Auxiliary operation	37.97	.00346	37.76	.00191
Subsistence	40.95	.00373	38.98	.00198
Insurance	33.08	.00302	39.66	.00201
Sub-total (operation)	$593.26	$0.05403	$458.29	$0.02327
Maintenance:				
Cutting machinery	$ 11.11	$0.00101	$ 8.79	$0.00045
Hull pipe and fittings	15.33	.00139	7.63	.00039
Ground tackle	7.90	.00072	15.69	.00079
Dredging pump	35.02	.00319	75.58	.00383
Power plant auxiliaries	48.10	.00438	72.04	.00365
Miscellaneous dredging plant	18.69	.00170	15.40	.00078
Hull and house	10.89	.00099	12.89	.00065
Miscellaneous supplies and labor	10.38	.00095	11.60	.00059
Insurance	3.54	.00032	2.13	.00011
Sub-total (maintenance)	$160.96	$0.01465	$221.75	$0.01124
Total operation and maintenance	754.22	.06868	680.04	.03451
Booster operation	.....	.00594	.....	.....
Total all items	.....	$.07462	.....	$0.03451

Lime From Oyster Shells

The Haden Lime Co., Houston, Texas, Has Rotary Kiln Plant—The Only One of Its Kind in the World

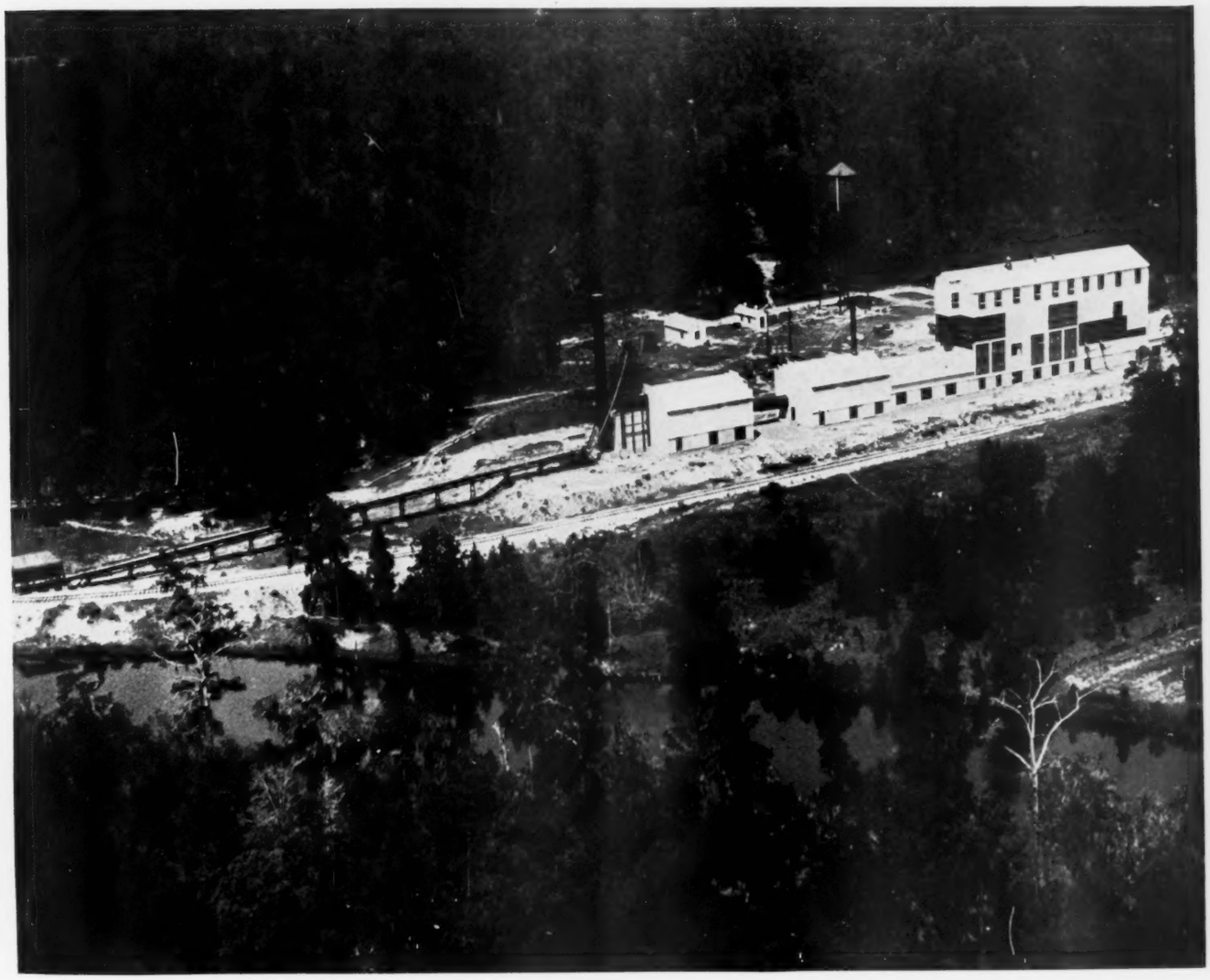
THE W. D. HADEN CO., Houston, Tex., is a large producer of oyster shells in the vicinity of Corpus Christi, Galveston and Houston, Tex., marketing many million tons per year for use in the production of portland cement, as a highway material, railroad ballast and for fertilizer purposes. Its activities also include a building material business in Houston and the production of sand and gravel.

Realizing the possibilities of manufacturing lime from oyster shells, the company employed the services of Arnold and Weigel, Inc., lime plant engineers, Woodville, Ohio, to make preliminary investigation of the technical methods available for such a manufacturing process. After considerable experimental work the plant construction was started during July, 1928, and on October 9, 1929, the plant started production of quick lime and hydrated lime, using oyster shells as the raw material and calcining them in a rotary kiln.

The starting of this plant is the outstanding event in the lime industry for this year and as far as that is concerned for the past several years, since this is the first time in history, so far as can be determined, that oyster shells have been calcined to lime in a rotary kiln. The delay in plant construction was due to unprecedented rains and railway washouts in that vicinity. These delays were both in delivery and in erection of the plant, especially in the hydrating department.

The plant not only was designed for economical handling and burning of lime but for permanence and appearance in all the equipment and housing structures. The plant is of steel and reinforced concrete throughout and is inclosed in Dorn corrugated asbestos-cement siding and roofing, and represents an investment of approximately $500,000. The beauty of execution of the design places the lime plant in a class with some modern cement plants, rather than with lime plants.

At the time plans for the construction of this plant were made public rumor was rife



General view of The Haden Lime Co.'s plant near Houston, Texas—the only plant of its kind in the United States burning lime from oyster shells using the rotary kiln method

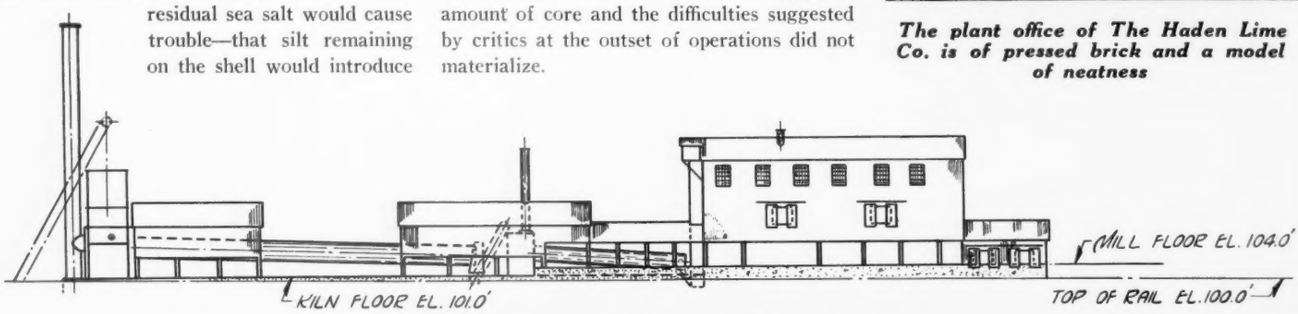
Belt conveyor carrying shell from dock to plant

that the effort would end in disaster—that the shells would dust and thus would coat the shell and prevent proper burning—that residual sea salt would cause trouble—that silt remaining on the shell would introduce impurities; and other objections were raised, but after two months' operation all these objections have proved unsupported. The company is producing 80 to 85 tons of burned lime per day, considerably exceeding its expected tonnage by about 60 tons per day. Fuel consumption, using southern Texas natural gas having a B.t.u. value of 950 to 1000 per cu. ft., averages 6000 cu. ft. per ton of burned lime. The burned lime when it leaves the kiln, and after cooling, has a greenish hue, but the hydrate is snow white, and the lime will average 98% CaO, it is claimed. The company expects to increase the quality of the product by giving the shells a thorough washing prior to burning and is now constructing a new washing plant using a jig type washer of its own design for this purpose. The shells as now used have a very thin and hardly preceptible coating of clay on them and it is expected that plant washing will remove this coating.

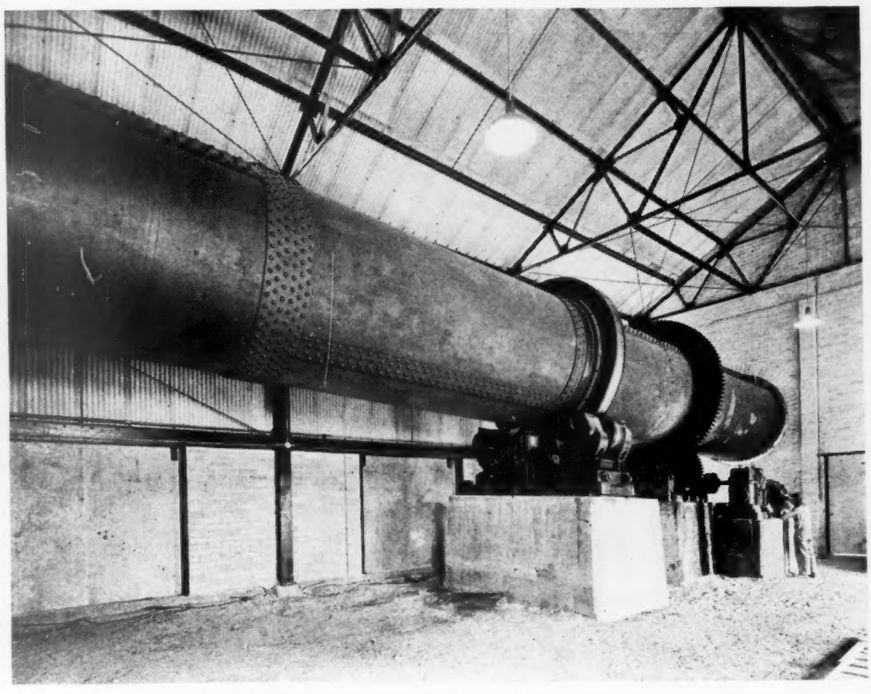
The rotary kiln is so operated that it requires one hour for the shells to pass through, with a temperature of 1300 deg. F. maintained in the breaching between the kiln feed end and the stack. Very little visible dust goes out the stack, but a small amount is collected in the breaching by means of "under and over" baffles. The lime burned under these conditions has a negligible amount of core and the difficulties suggested by critics at the outset of operations did not materialize.

Cecil R. Haden of the Haden Lime Co. sensed the fact there was apt to be a lack of open-mindedness in carrying to a successful conclusion a new venture of this kind in view of the predictions and in view of the lime industry's attitude in general, if old experienced lime men were employed in the plant. Accordingly his technical staff is composed of men of proven ability in other chemical engineering fields and are like his plant, a new departure in lime manufacture. Some trouble, it is true, was experienced at the outset in the calcining and hydrating

The plant office of The Haden Lime Co. is of pressed brick and a model of neatness



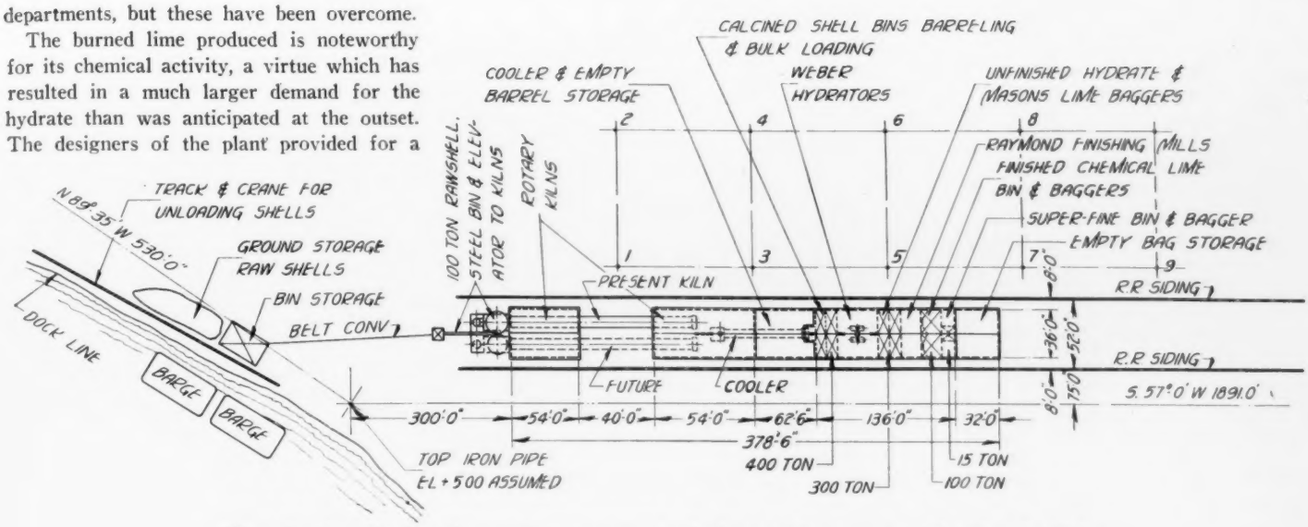
Side elevation of main mill building



Partial view of the rotary kiln and its drive mechanism

departments, but these have been overcome.

The burned lime produced is noteworthy for its chemical activity, a virtue which has resulted in a much larger demand for the hydrate than was anticipated at the outset. The designers of the plant provided for a

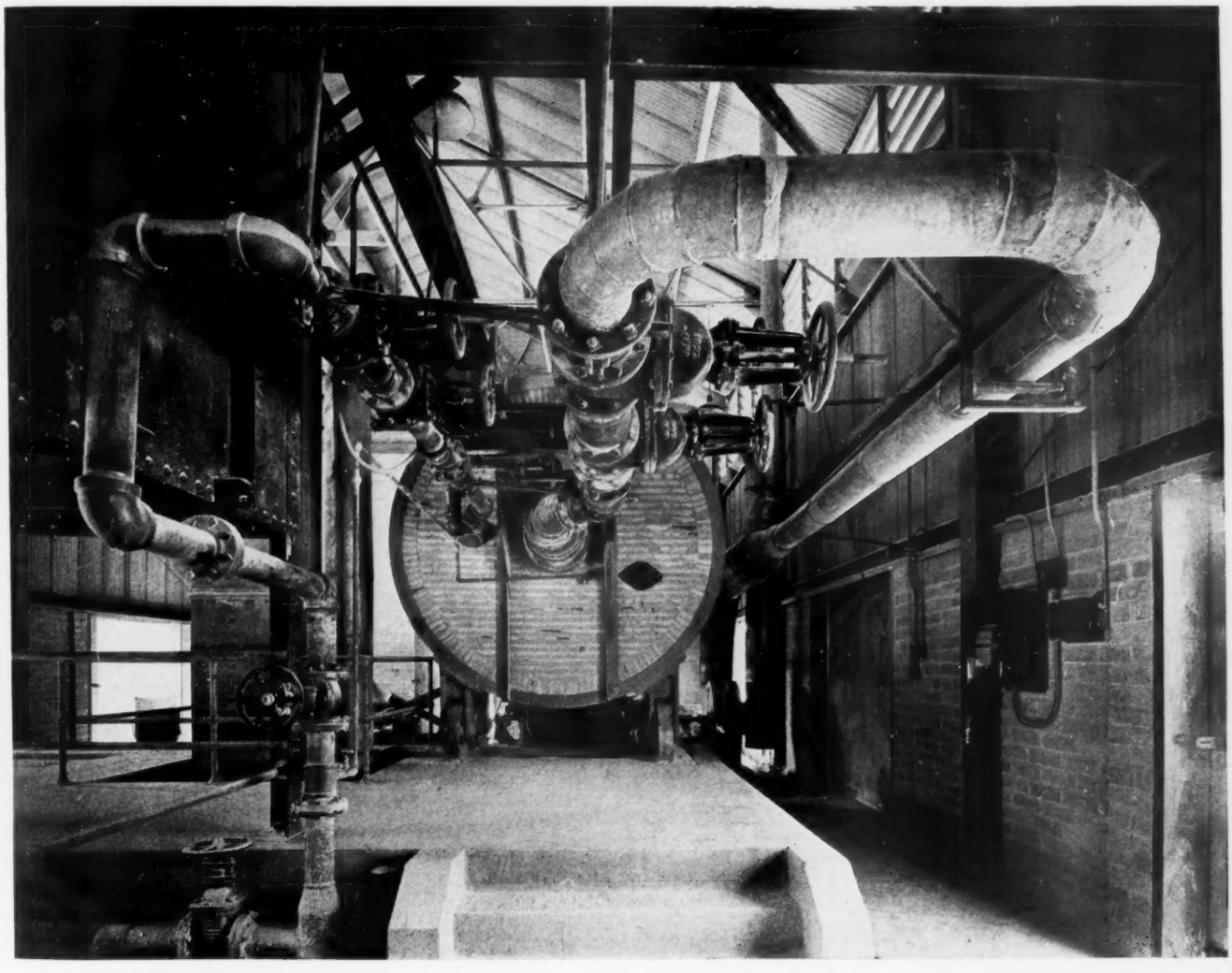


Plan showing the location and arrangement of plant with respect to docking facilities

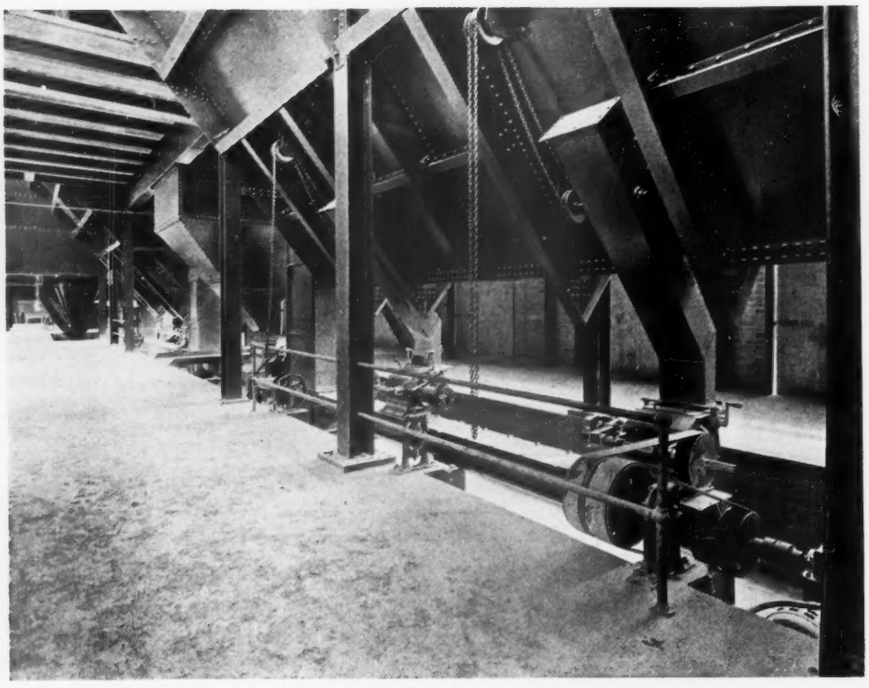
production of four batches of hydrate per hour, but this lime hydrates so quickly that a production of from 8 to 12 batches per hour is actually obtained.

The plant has a modern, neat and well equipped laboratory with T. A. Evans in charge as chemist. Hourly samples are taken and analyzed in the laboratory. The flow of shell, rotation of kiln, gas pressure, air pressure, stack temperatures, etc., are checked every hour, and a uniform operating condition is maintained, insuring a uniform product. Brown recording pyrometers are used for temperature control.

Both chemical and masons' hydrate are



Firing end of the rotary kiln burning lime from oyster shells, showing the natural gas fuel and air lines for combustion

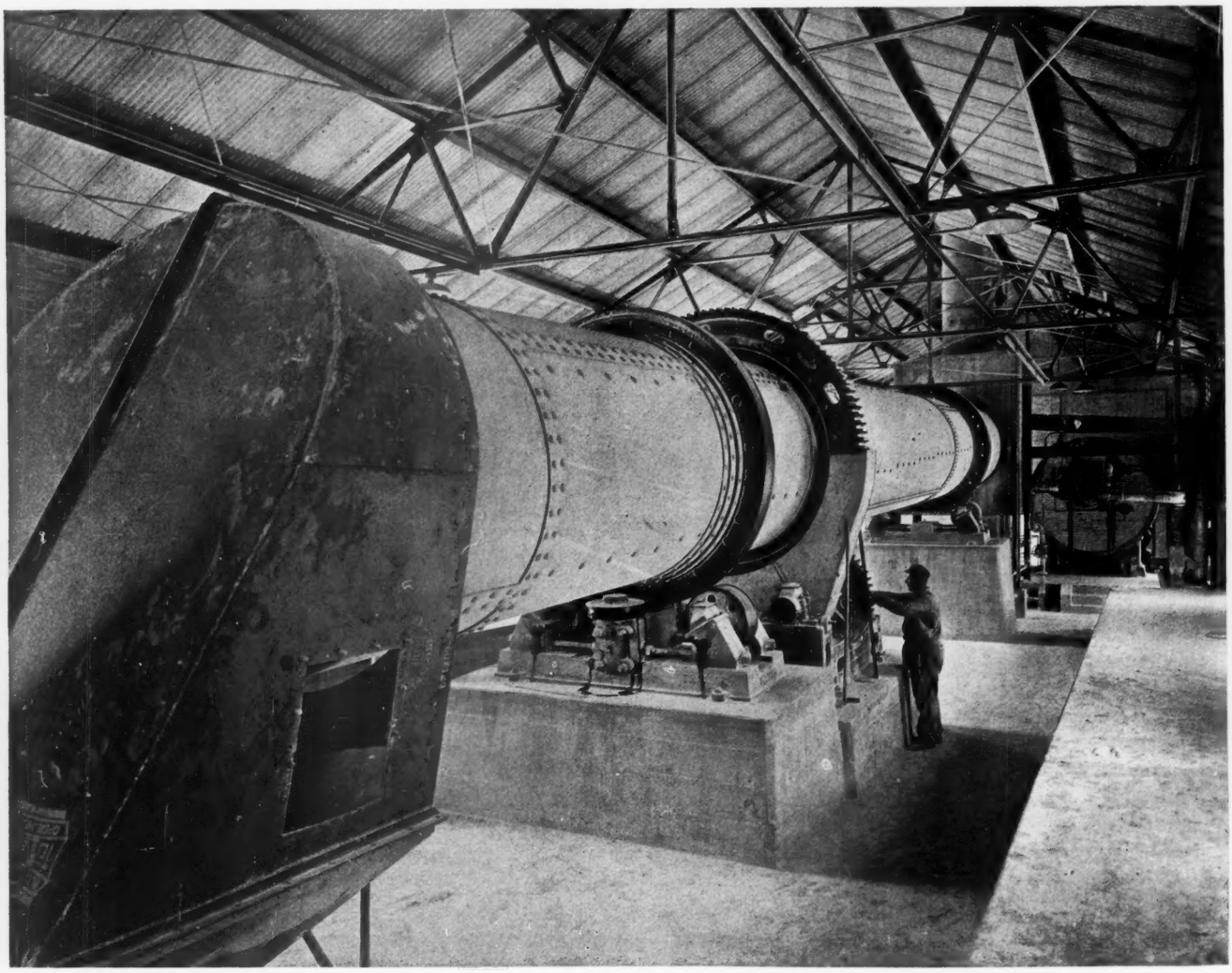


Raw lime storage bins with reclaiming screw conveyors

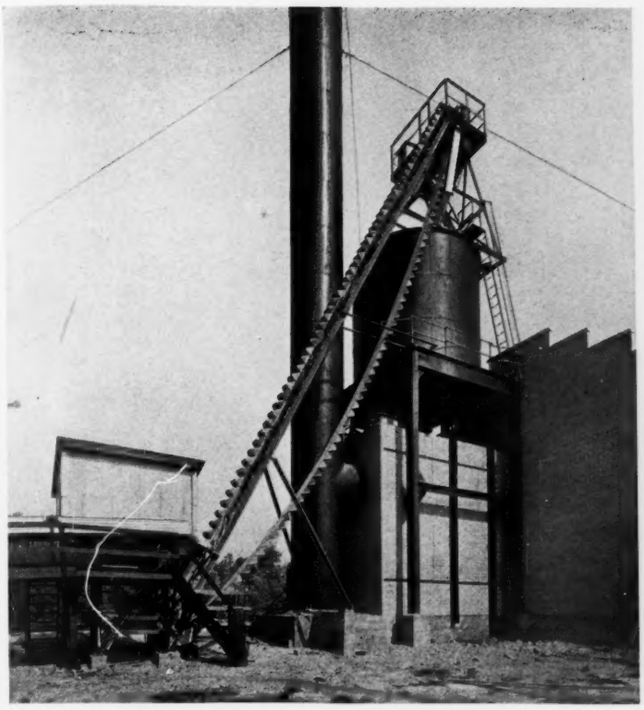
prepared and shipped in 40-lb. 3-ply, multi-walled, Bates paper bags. At present no waterproof liners are used in these paper containers. Shipments at present are by rail to Texas, Louisiana, Mississippi and points in more distant states with truck delivery to Houston proper. Later more distant shipments by water will be made, as very attractive water-haul rates have been obtained.

The company is now interested in the possibilities of manufacturing sand-lime brick as one outlet for its lime production, and for sand from its own dredging operations. Tentative plans call for using steam generated with waste heat from the kilns for the sand-lime brick manufacture. As Houston alone uses approximately 10,000,000 clay bricks per year and the nearest producer is 125 to 150 miles away, the project at the outset has all the appearance of a success. Power for the lime plant is purchased from the Houston Lighting and Power Co. and gas from the Dixie Gulf Gas Co.

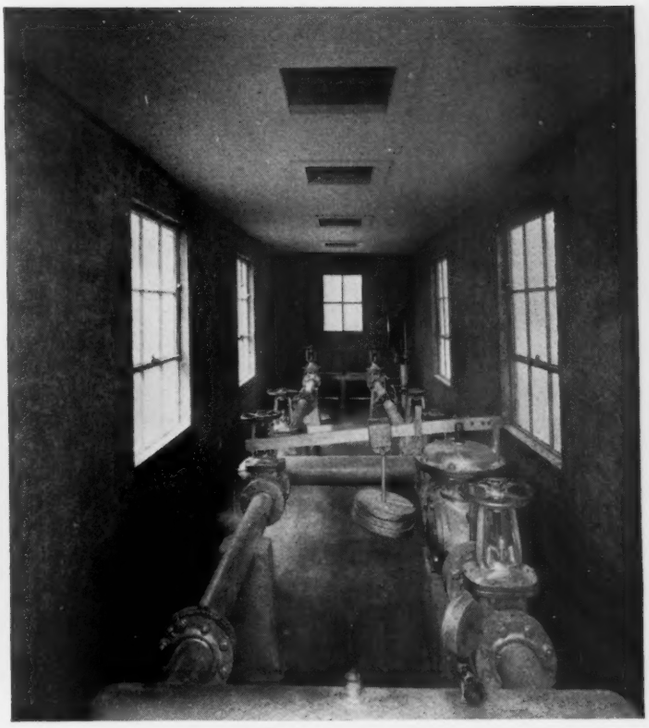
The Haden Lime Co. has offices at 1720 Shepard street, Houston, and the new lime plant is located 15 miles east of that city on Green bayou, about 1½ miles from the



In the foreground is shown the rotary cooler and in the background the hot end of the rotary kiln



The belt conveyor from dock discharges to this bucket elevator serving a steel storage tank

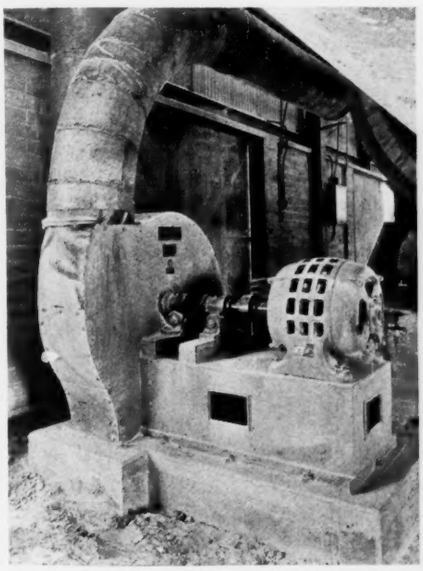


Natural gas is purchased and metered in this room that is a model of neatness and design

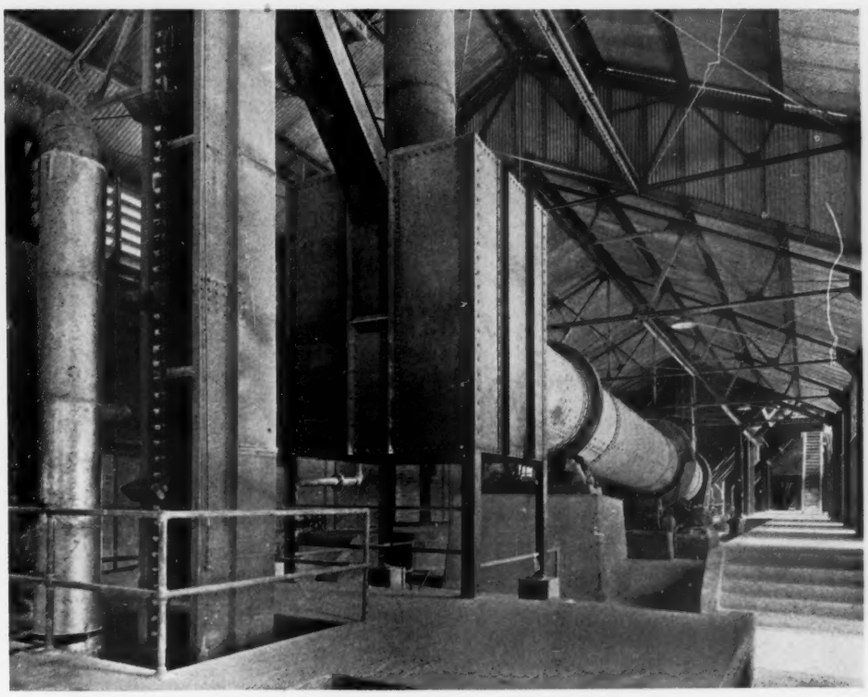
Houston ship channel. The bayou at that point has a depth of 20 ft. so that the company's own barges loaded with shell dock without difficulty.

The shells are all washed on the company's own dredges with rotary screens mounted on the decks of the dredges, using salt water and giving a shell containing about 1½% of foreign matter, mostly organic with some silica, clay, etc. Further washing at the plant will reduce this percentage considerably. The plant, in addition to the water shipping facilities, is served by the Missouri Pacific railroad. The barges on arriving at the company's dock, towed by its own fleet of tow boats, are unloaded to a reciprocating batch feeder by a ¾-yd. Northwest, gasoline crawler crane, the hopper serving an 18-in. belt conveyor that has a center to center length of 300 ft. All the units in the plant are driven by Fairbanks-Morse, ball-bearing, motors, and where speed reduction is required all the various machinery is driven through Jones' speed reducers. By reference to the motor schedule at the conclusion of the article the horsepower, r.p.m. drive, etc., will be found. Details as to elevators and screw conveyors are also included.

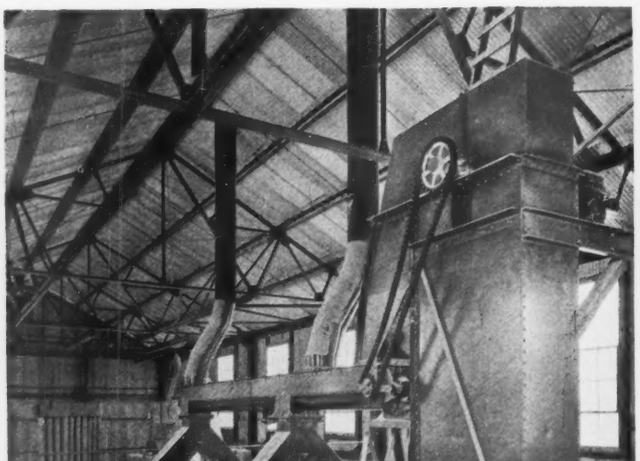
The 300-ft. belt conveyor uses a belt run-



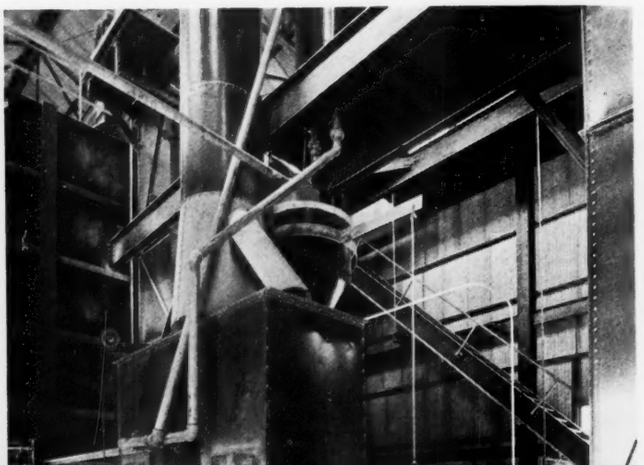
The blower supplying air to the kiln burners



Hot air for combustion is taken from the elevator pit in foreground by the pipe at the left. The cooler shows in background



Bucket elevator and screw conveyors delivering the hydrated lime to aging bins



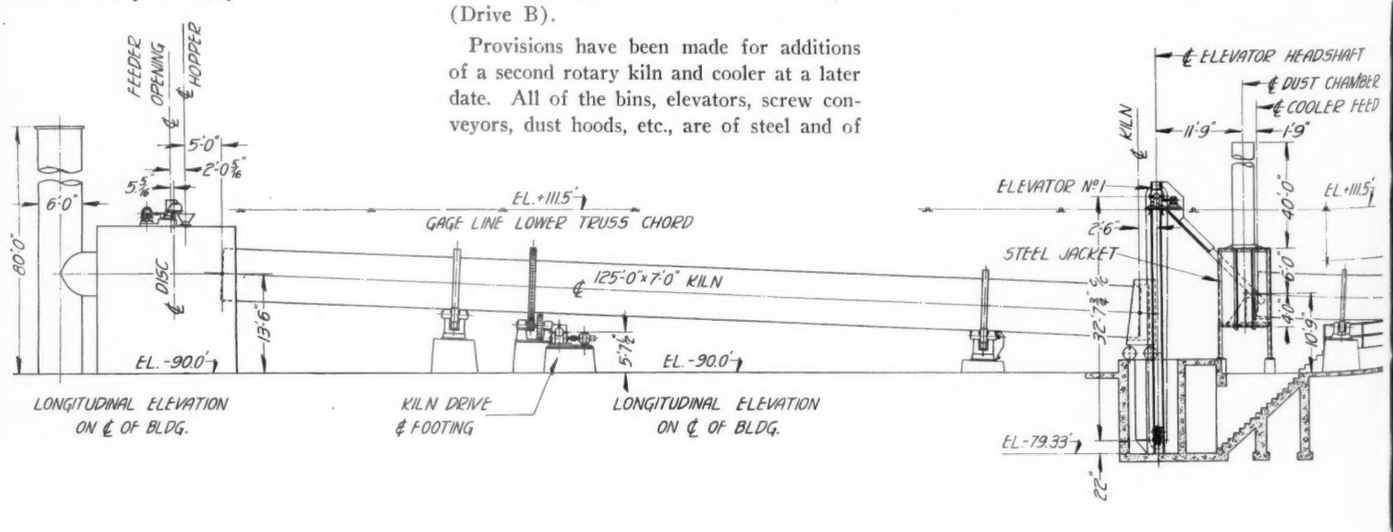
Owing to the activity of the lime produced this hydrator develops unusual tonnage

ning on Stearns, anti-friction, Alemite lubricated carrier and return rolls. The belt discharges to a bucket elevator serving a steel, kiln-storage bin. The elevator was supplied by the Chain Belt Co. and all the elevators and conveyors used in the balance of the plant were supplied by the Link-Belt Co.

The shell in this bin is fed by a 30-in. disc type, Bonnot feeder (See Drive A), to the 7x125-ft. Traylor rotary kiln. The kiln is lined with Laclede-Christie fire brick and is gas fired, using a 14-in. Tate Jones burner. The burner has a capacity of 6000 cu. ft. of gas per minute at 6 oz. pressure, with the air combustion supplied by a 12-in. Sturtevant blower (Drive C). The speed of the kiln is kept in the neighborhood of one revolution per minute, although the direct-current motor and drive provide for a 50% variation in speed either way. The slope of the kiln is 5/8 in. per lineal foot of length (Drive B).

Provisions have been made for additions of a second rotary kiln and cooler at a later date. All of the bins, elevators, screw conveyors, dust hoods, etc., are of steel and of dust proof construction and given a base coat of black graphite followed by a coat of battleship gray paint.

The lime falls to a pit from which a bucket elevator (Drive D, Elevator No. 1) takes the material and delivers it to a 6x60-ft. rotary Traylor cooler. The bearings on the kiln and cooler are of the anti-friction type. The cooled lime falls to a bucket elevator (No. 2) through a dust hood and discharges to a 14-in. screw conveyor (No. 1)



Longitudinal elevation of the new lime plant

mounted over four, steel, air-tight bins holding 125 tons each. From these bins the lime is reclaimed by another 14-in. screw (No. 2) that delivers to the foot of bucket elevator (No. 3) that serves the weighing hopper of the Weber batch hydrator. The water measuring tank and hydrator dust collectors are mounted over the hydrator with the latter venting to the atmosphere. The hydrator discharges to a dust-tight steel hopper from which screw conveyor No. 3 (14-in.) delivers the hydrate to a bucket elevator (No. 4) that in turn serves a screw conveyor (No. 4) that is mounted on top of the hydrate bin. This bin has four pockets, each holding 125 tons.

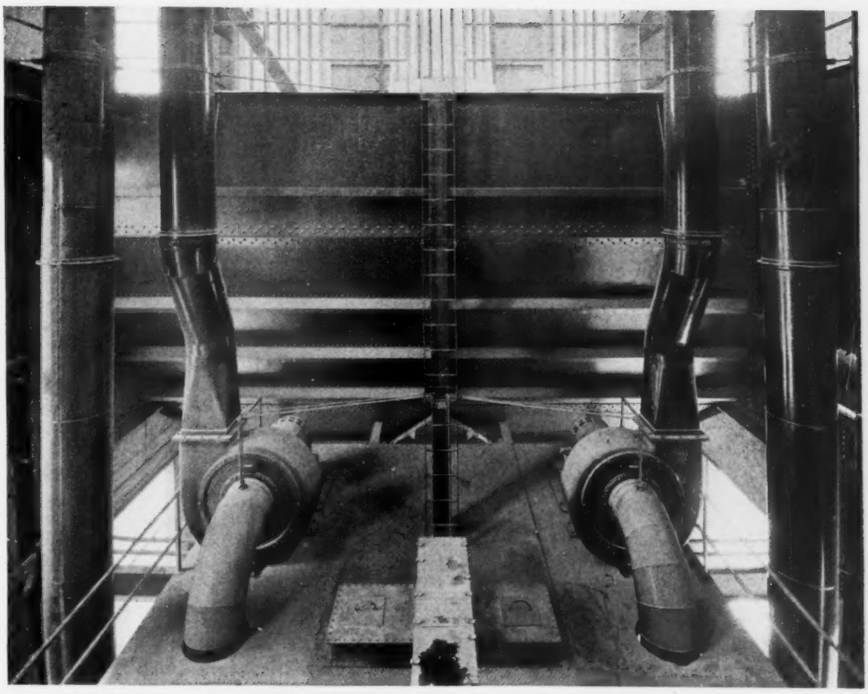
The contents of these bins are fed to a 14-in. screw conveyor (No. 5) by means of two 12x24-in. Raymond hydrated lime feeders that are belt driven from the screw conveyor drive.

Screw conveyor No. 5 serves another bucket elevator (No. 5) that in turn discharges to the No. 0 Raymond mills. At present only two mills have been installed, but provision has been made under this conveyor to install two more mills when necessary.

There are two Raymond mills, one for pulverizing mason's lime and the second for chemical lime. They are so arranged that the two products can be kept separate throughout the balance of the plant.

The Raymond mills are provided with a No. 11 exhauster that discharges to a cyclone dust collector mounted over the steel bagging bin. The vented air on the cyclone passes to an 8-ft. tubular Raymond collector for collection of the "superfine" hydrate, which is spouted to a separate bin and sacked in a 2-tube Bates packer.

All elevators except No. 6 are constructed of 3/16-in. steel plate with 2x2x¼-in. angle irons and with removable panels for cleaning up and taking up lower sprockets. The casings are 20 in. by 4 ft. inside and are made of No. 10 gage steel plate with angle irons for diagonal stiffeners.

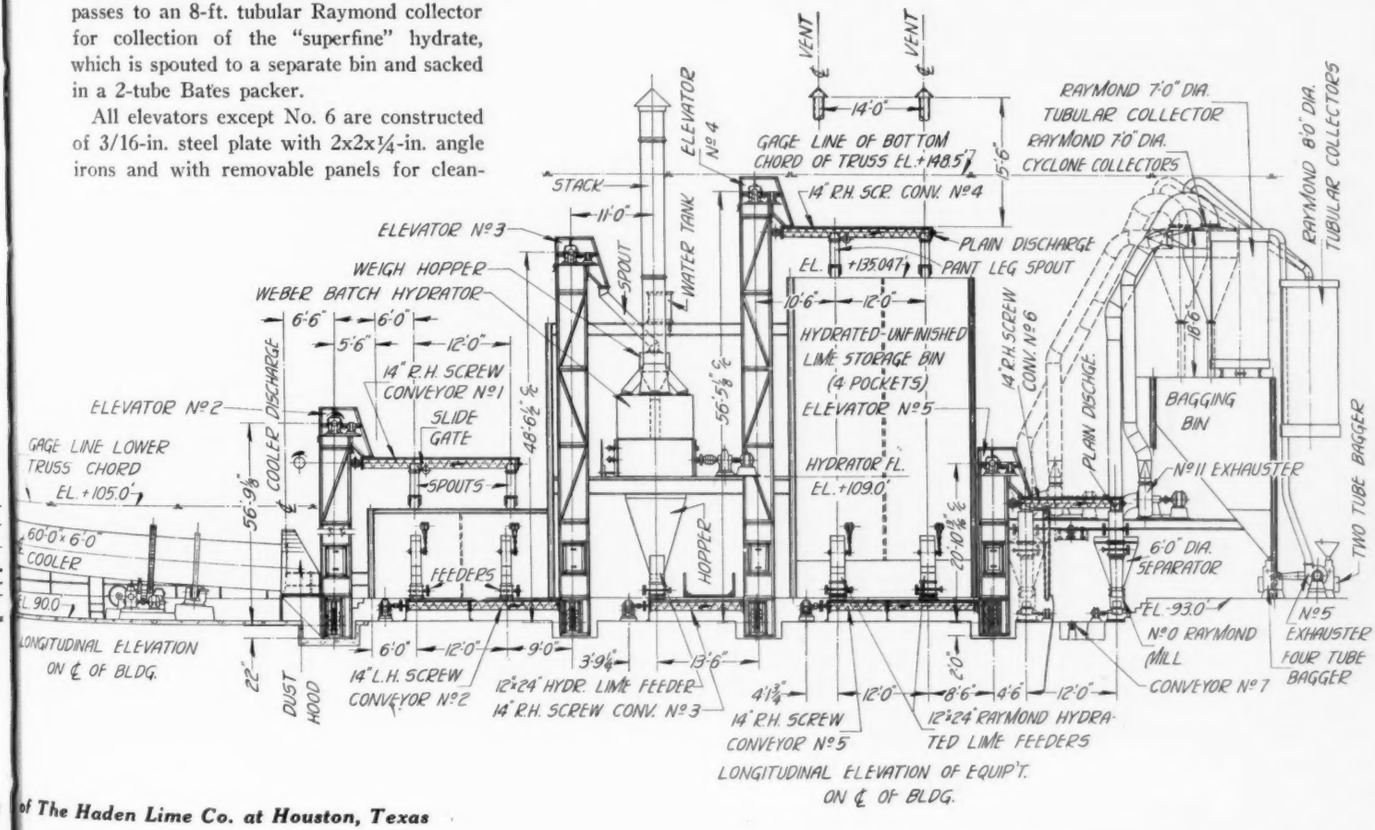


Fans over chemical bins (right) and mason's hydrate bins (left)

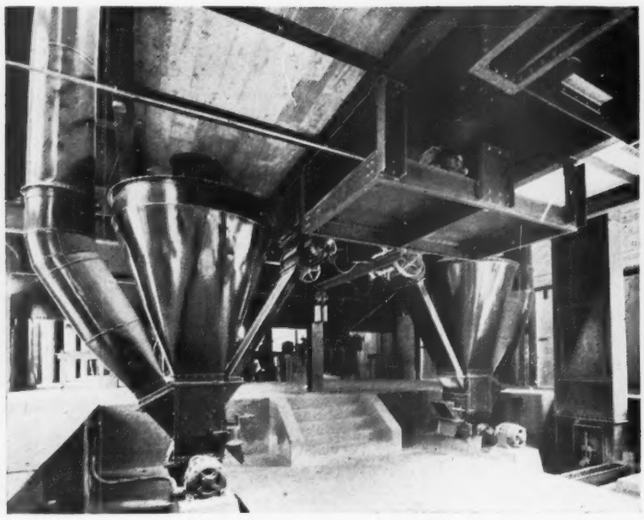
Chain speeds of 243 ft. per min. based on 1150 r.p.m. of drive motors with buckets 75% loaded or 0.1697 cu. ft. per bucket using a style "AA" 14x7-in. malleable iron bucket give the following capacities per hour:

	Tons per hour	Weight of material
Elevator No. 1	10.423	40 lb. cu. ft.
Elevator No. 2	10.423	40 lb. cu. ft.
Elevator No. 3	15.974	40 lb. cu. ft.
Elevator No. 4	15.71	25 lb. cu. ft.
Elevator No. 5	15.71	25 lb. cu. ft.

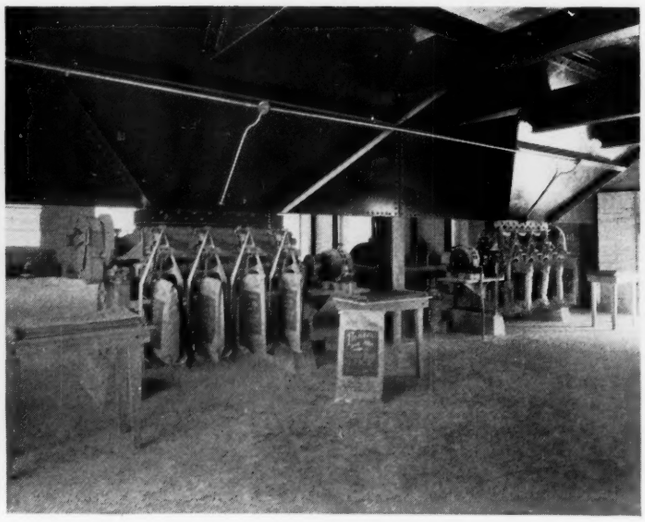
Elevator No. 6 is of the same construction



of The Haden Lime Co. at Houston, Texas



Two pulverizers are used—one for chemical lime and one for mason's hydrate



These two packing units insure that the mason's hydrate and chemical lime are kept separate

as the others but with 3/16-in. angles for strengthening instead of ¼-in. Its chain speed is 221 ft. per min. and with a 6x4-in. bucket every fourth link and has a calculated capacity of 4.75 tons per hour.

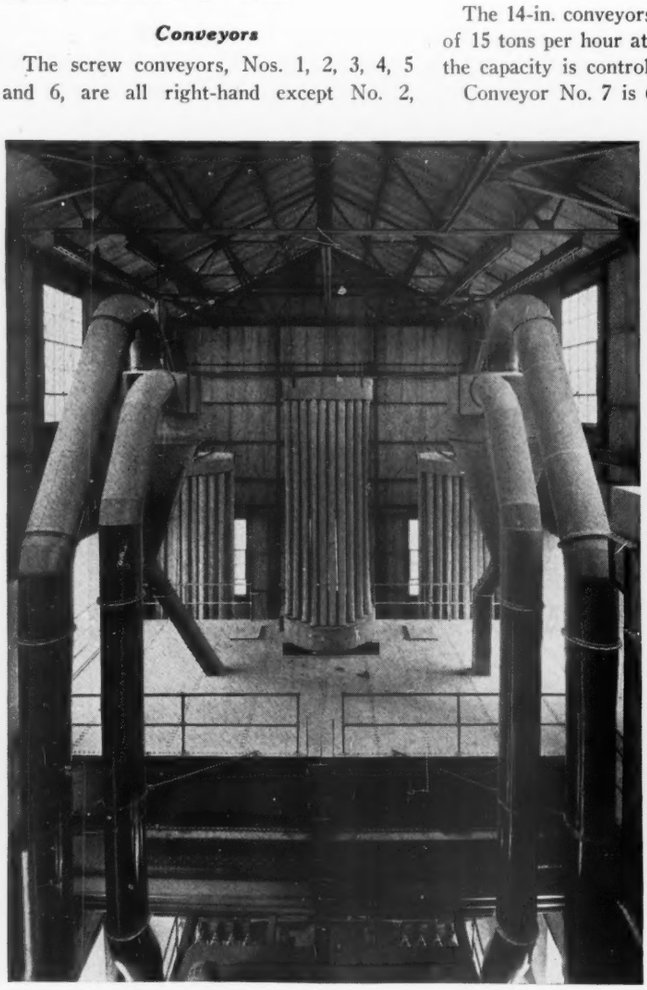
Conveyors

The screw conveyors, Nos. 1, 2, 3, 4, 5 and 6, are all right-hand except No. 2, which is left-hand. All are 14 in. in dia. with 14-in. pitch. The flights are 3/16-in. on extra heavy 2-in. pipe. Rack and pinion gates control feed and outlets to the conveyors.

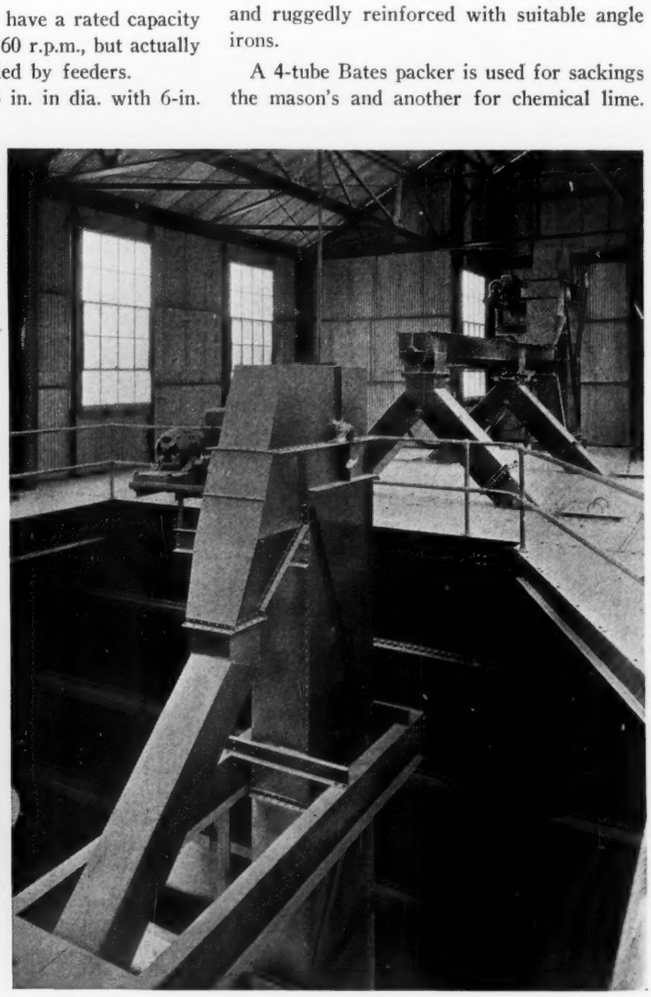
The 14-in. conveyors have a rated capacity of 15 tons per hour at 60 r.p.m., but actually the capacity is controlled by feeders.

Conveyor No. 7 is 6 in. in dia. with 6-in. pitch, ⅛-in. flights on 1½-in. dia. pipe and has a capacity of 4.75 tons per hour at 100 r.p.m. The elevator and conveyor bearings are all arranged for Alemite lubrication. The conveyor housings are all of ⅛-in. steel and ruggedly reinforced with suitable angle irons.

A 4-tube Bates packer is used for sackings the mason's and another for chemical lime.



The two tubular dust collectors in rear are for chemical and mason's "superfine" hydrate. The collector in foreground collects dust from packers



Elevator from coolers discharge to the screw conveyor (in rear) feeding raw lime bins. The elevator in foreground supplies the hydrator below

The spill from these packers is collected by means of a 6-in. fan that takes it from the side of packers' housing and delivers the dust to a second 7-ft. tubular collector mounted alongside of the main cyclone collector and discharges to the same bin.

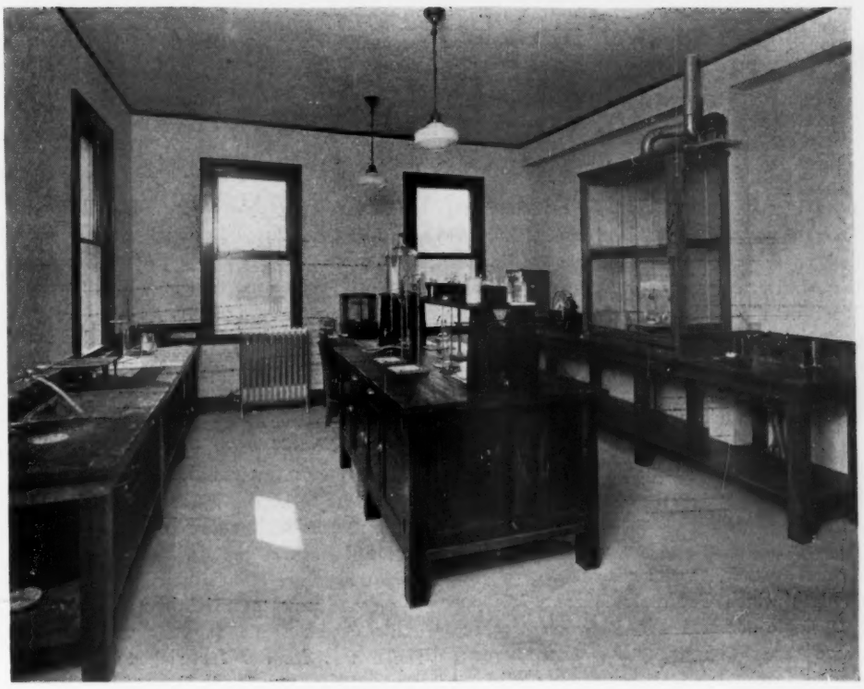
The attached motor schedule was prepared from data supplied by the engineers, Arnold and Weigel, Woodville, Ohio. The control devices for the motors of the squirrel-cage type up to and including 5 hp. are the magnetic contactor across-the-line type with thermal overload protection and push-button stations.

The 7½-hp. motors and larger, use enclosed automatic compensators with overload and under-voltage protection, employing push-button stations.

The slip-ring type motors and control devices consist of enclosed or magnetic contactor panel having overload and no voltage protection; resistors and drum controller to suit conditions.

The personnel of the Haden Lime Co. comprises: W. D. Haden, president and purchasing agent; W. A. Wansley, vice-president and general manager; E. D. Haden, secretary; C. R. Haden, treasurer and sales manager.

The operation of the plant requires a total of 12 men, including the superintendent and chemist. W. G. Carlson is in charge of the plant.



The laboratory of The Haden Lime Co. is modern in every respect

Processing Slag for Aggregate in England

THE large slag banks, residues from steel manufacture in the north of England, are being drawn upon in large quantities for road aggregate. At one time disposal of this material was a source of great expense to the steel people; a good deal of it was loaded on special scows and dumped into the North Sea.

But now a new process of converting molten slag direct into a suitable road material has been evolved by Bolckow, Vaughan and Co., Ltd., large steel producers at Middlesborough.

Slag from the basic blast furnaces is run into ladles, which take it to casting pans alongside the furnaces, where it is cast into large cakes about 15 in. thick. While cooling, the slag anneals itself, and a material almost as hard as granite and impervious to water is secured. The slabs, when cool, are broken and crushed, screened and graded ready for delivery to the road contractor and public authorities. A remarkable feature is that this material is supplied to a definite analysis, and consequently possesses an advantage over material worked from disused slag tips.

The company's experiments have attracted great interest among road making authorities, and recently, it is stated, entered into contracts involving the delivery of hundreds of thousands of tons of the new material to road contractors in the London and Home Counties area. This business has been secured at the expense of Belgian producers of road material, and, with the excellent shipping facilities which exist on the Tees, there seems to be every prospect of the new industry developing very satisfactorily—*The Engineer* (England).

MOTOR SCHEDULE, THE HADEN LIME CO.—ALL OPERATING ON 220-VOLT, 3-PHASE, 60 CYCLE CURRENT

Item	Quan.	HP.	R.P.M.	Type*	Drives	Type motor	Frame motor	*No. gear reducer	*Style flexible couplings, motor	*Style coupling, slow speed	Ratio of reduction
A	1	1	1200	Squirrel-cage	Kiln feeder	H	4B	375-H	A	D	40:1
B	1	30	1200	Slip-ring, 50% speed variation	Rotary kiln	HV	M12B	975-H	A	—	10.5:1
C	1	25	1800	Double-wound-rotor, squirrel-cage	Air blower, Gas burner	HJ	10C	—	—	—	D. Con.
D	1	3	1200	Squirrel-cage	Bucket elevator, No. 1	H	6B	575	A	D	30:1
E	1	20	1800	Slip-ring	Rotary cooler	HJ	10C	775-H	A	—	4½:1
F	1	7½	1200	Squirrel-cage	Bucket elevator, No. 2, and screw conveyor, No. 1	HJ	8D	557-H	A	D	30:1
G	1	5	1200	Squirrel-cage	Feeder and screw conveyor, No. 2						
H	1	5	1200	Squirrel-cage	Bucket elevator, No. 3						
I	1	15	900	Slip-ring	Hydrator						
J	1	3	1200	Squirrel-cage	Screw conveyor, No. 3, and feeder						
K	1	5	1200	Squirrel-cage	Bucket elevator, No. 4, and screw conveyor, No. 4						
L	1	5	1200	Squirrel-cage	Screw conveyor, No. 5, and feeders						
M	1	3	1200	Squirrel-cage	Bucket elevator, No. 5, and screw conveyor, No. 6						
N	2	7½	1200	Squirrel-cage	No. 0, Raymond mills						
O	2	40	1200	Squirrel-cage	No. 11, Raymond exhauster						
P	1	5	1200	Squirrel-cage	12 by 24 Raymond feeder						
Q	1	5	1200	Squirrel-cage	Bucket elevator, No. 6, and conveyor, No. 7						
R	2	5	1200	Squirrel-cage	Bates 4-tube baggers						
S	1	3	1200	Squirrel-cage	Bates 2-tube bagger						
T	1	15	1800	Squirrel-cage	Raymond No. 5 exhauster						

*All motors are Fairbanks-Morse. All gear reducers and flexible couplings are W. A. Jones Foundry and Machine Co.

Admixtures in Concrete and Relations of Strength and Workability

Reviewed by Edmund Shaw
Contributing Editor, Rock Products

POWDERED ADMIXTURES and concrete were discussed by Duff A. Abrams in a paper delivered at the June meeting of the American Society for Testing Materials. Most of the tests were made with high-early-strength cement to show the relationship between strength and workability, with and without admixtures. A series of tests was run on various mixes and consistencies of plain concrete to determine relationships between workability and strength.

According to the paper, workability and strength may be considered complementary properties. There is an inter-relation of cement, water, water-cement ratio and strength which Professor Abrams has put in a single diagram, Fig. 9, which is reproduced here. The strengths shown are one-day strengths with high-early-strength cement. It is believed that this is the first diagram to show all the relationships mentioned. The cement and water figures are the pounds that were used, with 140 lb. of sand and 240 lb. of gravel. The flow as shown by the flow table is held to be a sufficient measure of workability. As the flow is increased each increase of 10 above 180 means a loss of 5% to 8% in strength.

Effect of Adding Cement

The effect of adding cement is about 1% increase in strength for each 1% of cement added. The paper shows that for a given aggregate and a uniform flow the strength is proportional to the logarithm of the quantity of cement. According to the paper, "This is only another way of saying that the quantity of water required to give a fixed flow is directly proportional to the quantity of cement."

It is also stated that: "For a given water-cement ratio, flowability is increased about 2.0 flow units for each 1% added cement. For a given cement content, flowability is decreased about 1.0 flow units for each 1% of added cement."

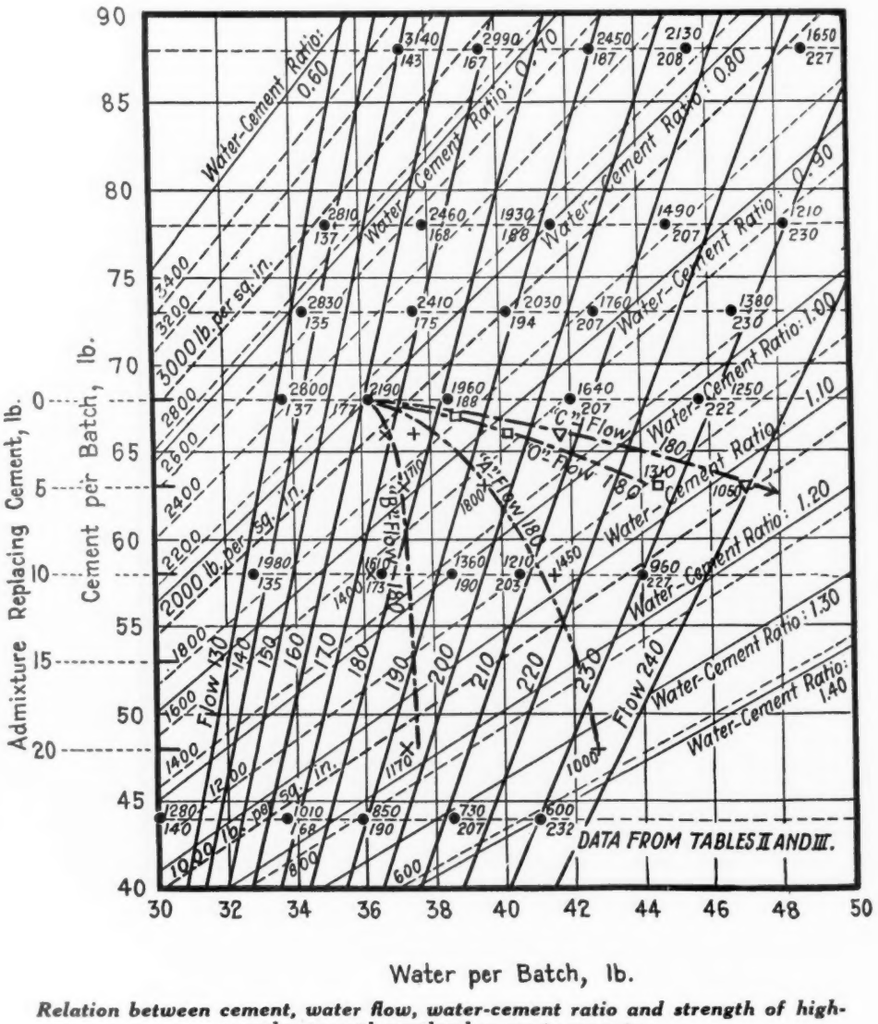
Concerning the effect of adding water, the paper says: "Each 1% increase in mixing water corresponds to an increase in flowability of 3.5 flow units, using 68 lb. cement, water 34 to 40 lb., as a basis for computation."

The admixtures tests were: (*A*) Hydrated lime; (*B*) limestone; (*C*) colloidal clay (treated); (*D*) colloidal clay; (*E*) colloidal clay; (*F*) moler clay (calcined); (*H*) volcanic ash; (*J*) slag; (*K*) precipitator dust; (*L*) artificial admixture; (*M*) artificial admixture; (*N*) artificial admixtures; (*O*) diatomaceous earth. Most of the tests were made with high-early-strength cement.

Tables and graphs in the report show results that indicate a lower strength concrete results when any of these were substituted for any part of the cement. There was an exception in the case of (*J*) slag, (*K*) precipator dust and (*N*) artificial admixture, which slightly increased the strength of the cement at early ages. These were all puzzolanic materials, those which have a slight cementing value when mixed with water.

The reason for the decrease in strength was found to be the increased water-cement ratio needed with admixtures. The water factor (which is defined as the water required by the addition of a unit weight of any constituent to maintain a given workability) was found to vary widely. The range was from 0 for slag to 195% for ground limestone and 238% for colloidal clay. Sand was found to have a water factor of 11% and gravel 4% for a flow of 180. The admixtures which had a puzzolanic effect all had low water factors.

The paper is an exceedingly valuable one from the great number of charts and tables it contains showing the relationship of concrete properties as well as the effect of admixtures.



Relation between cement, water flow, water-cement ratio and strength of high-early-strength portland cement concrete

Transverse Strength and Elasticity of Slag Concrete

SYMPOSIUM No. 19 of the above title contains abstract data on various tests made at different testing laboratories concerning the transverse and strengths, shear and modulus of elasticity of concrete made with slag, crushed stone and gravel aggregates. Acording to the data submitted, lack of standard methods and types of testing equipment, makes test comparisons difficult but in general the ultimate transverse strength of slag concrete is said to be at least equal to that of other concretes. Copies of this symposium are available from the National Slag Association, Cleveland, Ohio.

Editorial Comment

Cement Admixtures

Commercial admixtures, according to Duff A. Abrams, "must be classed as injurious adulterants" in concrete. This is his conclusion after the thorough testing described in his American Society for Testing Materials paper, which is abstracted in this issue. Yet there is construction evidence to fill a volume that admixtures have increased the strength and the workability of concrete as made on the job, and experience has so firmly borne this out that the manufacture of admixtures is a recognized branch of the industry.

There is abundant literature on the use of admixtures. In the past we have had the classic paper of Pearson and Hitchcock, the research of the Portland Cement Association and of Donahay and others. The past year has been fairly prolific of it. In Rock Products alone at least a dozen articles have appeared; the September 28, 1928, issue contains several articles on the subject. These were filled with figures of tests that showed important gains in strength and workability. It is stated in one of these that a common practice of Continental European engineers is to use trass and other admixtures to replace as much as 30% of the cement with advantage. Another article in the same issue gives tests by state highway and other laboratories showing increased strength due to use of pumicite.

At the American Concrete Institute meeting of this year papers dealt incidentally with admixtures. One author agrees with Prof. Abrams in finding them injurious; another giving figures and a graph, showed no loss of strength where the slump was increased to 6½-in. and a gain in strength thereafter. A. T. Goldbeck's tests on stone dust showed a slight fall in strength from its inclusion in concrete in his National Crushed Stone Association paper and J. C. Pearson in his American Society for Testing Materials paper found silt acted like a powdered admixture in increasing the strength of mortars.

No one will question that these varying results have been obtained by trained investigators who could not be misled by errors in manipulation, and so on. The conclusion is inescapable that these men dealt with widely varying materials or that they used them under different conditions.

E. S. Hastings, discussing diatomaceous earth in the March 16, 1929, issue of Rock Products shows microscopically why some diatomaceous earths make good admixtures and some do not. There may be equally good reasons for the varying effect of other admixtures, that is, differences in the admixture itself. As to aggregates, there is evidence that those which are deficient in fines are improved by the addition of fine powders. H. F. Gonnerman's American Society for Testing Materials paper quotes from Graf and Merkle to show that concrete is improved by the addition of fine particles where there is not enough cement to supply these. Graf's work on gradation is especially emphatic on this point. From these few examples it would seem that there are differences in both admixtures and aggregates, which might play an important part in tests on admixtures.

But the differences in cements are perhaps of greater importance. We have fallen into the unfortunate habit of thinking that all standard portland cements must be alike, although we know they are not alike, even though they all pass the standard specifications. P. H. Bates showed this in his 1928 American Concrete Institute paper, mentioning especially differences in plasticity which he measured with an extrusion apparatus. With 30% of water, some cements took 500 lb. pressure for a 1½-in. extrusion while others were so wet that they ran through like liquids. It is conceivable that the addition of a fine, inert powder might have affected the plasticity of some of these favorably and others unfavorably. And plasticity (or workability) and strength have a very close relationship.

Tests which have a more direct bearing on the matter are those reported by Alton J. Blank in the March 16, 1929, issue of Rock Products. He tested five different cements with diatomaceous earth as an admixture, using the same aggregate and mixing to the same consistency in all tests. In one the admixture acted as an injurious adulterant, steadily lowering the strength as increased percentages were added. With the other four cements a constant increase of strength was obtained, with small additions, and in the case of two cements the increase almost doubled the normal strength of the cement when large additions were made.

From these and other results it is evident that the use of admixtures is a subject for more extensive research than has been given hitherto. Experiments with one cement prove only the effect of admixtures with that cement. There should be a classification of cements before testing according to their plasticity, free lime content and any other characteristics that may be found to bear on the problem. And the effect of admixtures on aggregates should be studied as well.

In the cases where admixtures have increased strength and workability the increase has been so marked as to make them important concrete materials. What is needed now is sufficient knowledge to use them intelligently and only where they are needed; because we do not believe every one is willing to accept Prof. Abrams' conclusions that they are never needed.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[29]	12-17-29	90	.....	
Alpha P. C. new com.	12-16-29	30	31	75c qu. Oct. 15
Alpha P. C. pfd.	12-14-29	110	.....	1.75 qu. Dec. 14
American Aggregates com.[29]	12-17-29	10	20	75c qu. Mar. 1
Amer. Aggregate 6's, bonds	12-14-29	88	.....	
American Brick Co., sand-lime brick	12-13-29	.....	12½	25c qu. Feb. 1
American Brick Co. pfd., sand-lime brick	12-13-29	.....	80	50c qu. Nov. 1
Am. L. & S. 1st 7's[25]	12-17-29	95	97	
American Silica Corp. 6½'s[40]	12-17-29	90	95	
Arundel Corp. new com.	12-16-29	41½	.....	50c qu. Oct. 1
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[10]	12-17-29	No market		
Atlas P. C. com.	12-16-29	35⅛	37	50c qu. Dec. 2
Beaver P. C. 1st 7's[20]	11-29-29	97	100	
Bessemer L. & C. Class A[4]	12-16-29	28	30	75c qu. Nov. 1
Bessemer L. & C. 1st 6½'s[4]	12-16-29	90	92	
Bloomington Limestone 6's[29]	12-17-29	82	85	
Boston S. & G. new com.[47]	12-15-29	17	20	40c qu. July 1
Boston S. G. new 7% pfd.[47]	12-15-29	47	50	87½ qu. July 1
Calaveras Cement 7% pfd.	12-13-29	82	87	
Calaveras Cement com.	12-13-29	12½	14¾	
Canada Cement com.	12-13-29	18½	19	
Canada Cement pfd.	12-13-29	94	.....	1.62½ qu. Dec. 31
Canada Cement 5½'s[48]	12-13-29	98¼	99	
Canada Cr. St. Corp. 1st 6½'s[48]	12-13-29	95	99	
Can. Gyp. & Alabastine (new)	12-13-29	24¼	24½	37½c qu. Jan. 2
Certainteed Prod. com.	12-16-29	13½	14½	
Certainteed Prod. pfd.	12-16-29	50	59½	1.75 qu. Jan. 1
Cleveland Quarries new st'k	12-16-29	66	70	75c, 25c ex. Dec. 1
Columbia S. & G. pfd.	12-12-29	88	95	
Consol. Cement 1st 6½'s, A	12-17-29	90	.....	
Consol. Cement 6½% notes[24]	12-17-29	80	85	
Consol. Cement pfd.[29]	12-17-29	50	60	
Consol. Oka S. & G. 6½'s[13] (Canada)	11-23-29	98	100	
Consol. Rock Prod. com.[44]	12-12-29	2½	5	
Consol. Rock Prod. pfd.[44]	12-12-29	13	14	43¾c qu. Dec. 1
Consol. S. & G. com. (Can.)	11-18-29	15	.....	
Consol. S. & G. pfd. (Can.)	12-13-29	80	85	1.75 qu. Nov. 15
Construction Mat. com.	12-14-29	18¼	19	
Construction Mat. pfd.	12-14-29	39⅝	40½	87½c qu. Nov. 1
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[18]	12-12-29	92	98	
Coosa P. C. 1st 6's[29]	12-17-29	50	55	
Coplay Cem. Mfg. 1st 6's[40]	12-15-29	90	.....	
Coplay Cem. Mfg. com.[40]	12-15-29	10	.....	
Coplay Cem. Mfg. pfd.[40]	12-15-29	70	.....	
Dewey P. C. 6's[28] (1942)	12-17-29	97	.....	
Dewey P. C. 6's[28] (1930)	12-17-29	97	.....	
Dewey P. C. 6's[28] (1931-41)	12-17-29	97	.....	
Dolese & Shepard	12-16-29	85	90	$2 qu. Oct. 1
Edison P. C. com.[39]	12- 2-29	10c	.....	
Edison P. C. pfd.[39]	12- 2-29	25c	.....	
Giant P. C. com.[2]	12-12-29	15	25	
Giant P. C. pfd.[2]	12-12-29	20	30	3½% s.-a. Dec. 16
Ideal Cement, new com.[33]	12-14-29	63	65	50c spec., 50c ex. Dec. 21 & 75c qu. Jan. 1
Ideal Cement 5's, 1943[33]	12-14-29	98	100	
Indiana Limestone units[29] (5 shs. com. & 1 sh. pfd.)	12-17-29	No market		
Indiana Limestone 6's	12-16-29	74½	75	
International Cem. com.	12-16-29	55	56	$1 qu. Dec. 31
International Cem. bonds 5's	12-16-29	96	.....	Semi-ann. int.
Iron City S. & G. bonds 6's[48]	11-15-29	80	.....	
Kelley Is. L. & T. new st'k	12-16-29	45	.....	62½c qu., 50c ex. Jan. 1
Ky. Cons. St. com. Voting Trust Certif.[48]	12-12-29	12	13½	
Ky. Cons. Stone 6½'s[48]	12-12-29	96	100	
Ky. Cons. Stone pfd.[48]	12-12-29	88	92½	
Ky. Cons. Stone com.[48]	12-12-29	12	13½	
Lawrence P. C.	12-14-29	105	107	$1 qu. Sept. 28
Lawrence P. C. 5½'s, 1942	12- 4-29	80	.....	
Lehigh P. C.	12-16-29	36	40	62½c qu. Nov. 1
Lehigh P. C. pfd.	12-16-29	103¼	107	1¾% qu. Jan. 2
Louisville Cement[7]	12-16-29	230	.....	
Lyman-Richey 1st 6's, 1932[18]	11-18-29	96	99	
Lyman-Richey 1st 6's, 1935[18]	11-18-29	95	98	
Marblehead Lime 6's[14]	12-13-29	95	98	
Material Service Corp.	12-14-29	21	24¾	50c qu. Dec. 1
Medusa Portland Cem.[29]	12-17-29	115	120	1.50 Oct. 1
Mich. L. & C. com.[6]	12-15-29	35	.....	
Missouri P. C.	12-16-29	33	34	50c qu., 50c ex. Nov. 1
Monolith Midwest[9]	12-12-29	7¼	8½	
Monolith bonds, 6's[9]	12-12-29	97	98	
Monolith P. C. com.[9]	12-12-29	12	13	40c s.-a. July 1
Monolith P. C. pfd.[9]	12-12-29	8½	9½	40c s.-a. July 1
Monolith P. C. units[9]	11-14-29	31½	33	
National Cem. (Can.) 1st 7's[29]	12-17-29	100	102	
National Gypsum A com.	12-16-29	8	10	
National Gypsum pfd.	12-16-29	41	43	
Nazareth Cem. com.[26]	12-16-29	19	.....	
Nazareth Cem. pfd.[26]	12-16-29	92	.....	
Newaygo P. C. 1st 6½'s[29]	12-17-29	101	102	
New Eng. Lime 1st 6's[14]	12-13-29	95	98	
N. Y. Trap Rock 1st 6's	12-13-29	97½	.....	
North Amer. Cem. 1st 6½'s	12-14-29	58	58⅛	
North Amer. Cem. com.[29]	12-17-29	3	3½	
North Amer. Cem. 7% pfd.[29]	12-17-29	19	24	1.75 qu. Aug. 1
North Amer. Cem. units[29]	12-17-29	21	22	
North Shore Mat. 1st 5's[15]	12-17-29	95	.....	
Northwestern States P. C.[37]	12-14-29	130	140	2% Oct. 1
Ohio River Sand com.	12-16-29	.....	27½	
Ohio River Sand 7% pfd.	12-16-29	99	102	
Ohio River S. & G. 6's[16]	12-15-29	85	95	
Pac. Coast Agg. 6½'s[23]	11-14-29	99	.....	
Pac. Coast Agg. 7's[23]	11-14-29	99	.....	
Pacific P. C. com.	12-13-29	24	30	$2 Dec. 18
Pacific P. C. pfd.	12-13-29	77	80	1.62½ qu. Oct. 5
Pacific P. C. 6's[5]	10-17-29	99¼	100	
Peerless Cem. (old) com.[21]	11-18-29	1	2½	20c Dec. 20
Peerless Cem. (old) pfd.[21]	11-18-29	80	85	1.75 Dec. 31
Penn-Dixie Cem. 1st 6's	12-14-29	71	72⅛	
Penn-Dixie Cem. pfd.	12-16-29	31	35¾	1.75 qu. Sept. 15
Penn-Dixie Cem. com.	12-16-29	5⅝	6	
Penn. Glass Sand Corp. 6's†	12- 4-29	100	102	
Penn. Glass Sand pfd.	12- 4-29	100	.....	1.75 qu. Oct. 1
Petoskey P. C.	12-16-29	.....	10	1½% qu. Sept. 1
Riverside P. C. com.	12-13-29	.....	20	
Riverside P. C. pfd.[9]	12-12-29	82	87	1.50 qu. Nov. 1
Riverside P. C., A[9]	12-12-29	13	16	31¼c qu. Nov. 1
Riverside P. C., B[9]	12-12-29	5	.....	
Santa Cruz P.C. 1st 6's, 1945‡	12- 2-29	108½	.....	6% annually
Santa Cruz P. C. com.	12-13-29	95	.....	$1 qu. Oct. 1
Schumacher Wallboard com.	12- 2-29	8½	10	
Schumacher Wallboard pfd.	12-13-29	20½	24	50c qu. Nov. 15
Southwestern P. C. units[44]	12-12-29	270	.....	
Standard Paving & Mat. (Can.) com.	12-13-29	25	25¾	50c qu. Nov. 15
Standard Pav. & Mat. pfd.	12-13-29	.....	89	1.75 qu. Nov. 15
Superior P. C., A	12-13-29	40½	41½	27½c mo. Jan. 1
Superior P. C., B	12-13-29	14	15	
Trinity P. C. units[27]	12-14-29	125	135	
Trinity P. C. com.[37]	12-14-29	48	.....	
Trinity P. C. pfd.[29]	12-17-29	105	115	
U. S. Gypsum com.	12-16-29	44¾	45¾	2% qu. Dec. 31
U. S. Gypsum pfd.[29]	12-17-29	117	126	1¾% qu. Dec. 31
Universal G. & L. com.[3]	12-17-29	50c	.....	
Universal G. & L. pfd.[3]	12-17-29	6	.....	
Universal G. & L., V.T.C.[3]	12-17-29	No market		
Universal G. & L. 1st 6's[3]	12-17-29	No market		
Warner Co. com.[16]	12-15-29	35	45	50c qu., 50c ex. Jan. 15
Warner Co. 1st 7% pfd.[16]	12-15-29	95	100	1¾% qu. Jan. 15
Warner Co. 1st 6's[8]	12- 4-29	97	100	
Whitehall Cem. Mfg. com.[38]	12-16-29	125	.....	
Whitehall Cem. Mfg. pfd.[38]	12-16-29	98	.....	
Wisconsin L. & C. 1st 6's[15]	12-17-29	95	.....	
Wolverine P. C. com.	12-16-29	4½	5	15c qu. Nov. 15
Yosemite P. C., A com.[9]	12-12-29	2¼	3¼	

†$52,000 called for redemption at 105, January 1, 1930. ‡Entire issue called for redemption at 110, March 1, 1930.

[1]Quotations by Watling Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willett, New York. [3]Quotations by Rogers, Tracy Co., Chicago. [4]Quotations by Butler Beadling & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]By J. J. B. Hilliard & Son, Louisville, Ky. [8]Quotations by Dillon, Read & Co., Chicago, Ill. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Peters Trust Co., Omaha, Neb. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central Trust Co., of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hoit, Rose & Troster, New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simons & Co., Inc., Detroit, Mich. [22]Hemphill, Noyes & Co., New York City, N. Y. [23]California Co., Los Angeles, Calif. [24]A. B. Leach & Co., Inc., Chicago, Ill. [25]Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [28]Bank of Republic, Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago, Ill. [33]Boettcher Newton & Co., Denver, Colo. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick & Co., Montreal, Quebec. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [41]Hornblower & Weeks, New York City and Chicago. [42]Jones, Heward & Co., Montreal, Que. [44]Tenney, Williams & Co., Los Angeles, Calif. [46]Stein Bros. & Boyce, Baltimore, Md. [47]Wise, Hobbs & Arnold, Boston. [48]E. W. Hays & Co., Louisville, Ky. [49]Blythe Witter & Co., Chicago, Ill.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
American Brick Co. pfd., 50 sh.[5] (par $25) per sh.	22½ ex-div.	.....
American Brick Co. com., 20 sh.[8]	$10 per share	.....
American Brick Co. pfd., 20 sh.[8] (par $25)	$18 per share	.....
Atlantic Gypsum Prod. Co. pfd., 750 sh.[10]	$10 per share	.....
International Portland Cement Co., Ltd., pfd.	30	45
New England Lime Co. Series B 60 sh.[9]	$15 per share	.....
Southern Phosphate Co.[6]	1¼	.....
Universal Gypsum com. free stk.[1] 300 shares	$75 for the lot	.....
Vermont Milling Products Co. (slate granules), 22 sh. com. and 12 sh. pfd.[6]	$1 for the lot	.....
Winchester Rock Brick Co., pfd., 1 share (par $25) and 1 share com. (par $10)[6]	$8 for the lot	.....

[5]Price at auction by R. L. Day & Co., Boston, October 23, 1929. [6]Price at auction by Wise, Hobbs & Arnold, Boston, Mass., June 19, 1929. [8]Price at auction by Wise, Hobbs & Arnold Boston, October 16, 1929. [9]Price at auction by R. L. Day & Co., Boston, October 16, 1929. [10]Price at auction by R. L. Day & Co., Boston, November 6, 1929.

U. S. Steel Makes Offer for Atlas Portland

STOCKHOLDERS of the Atlas Portland Cement Co. have been apprised by the company of an offer of the United States Steel Corp. to take over the assets of the concern in exchange for 180,000 shares of steel stock valued at $31,320,000.

In exchange for the stock the steel corporation would acquire the 899,211 shares of common stock of the Atlas company, together with its entire assets and good will. The preferred stock of the company was retired recently and there is no bonded indebtedness.

A special meeting of stockholders has been called for December 28 to ratify the agreement. In a letter to the Atlas stockholders, John R. Morron, president, says:

"The board of directors wishes to advise you that it has received from the United States Steel Corp. an offer to purchase the entire assets of the Atlas Portland Cement Co. for 180,000 shares of the common stock of the United States Steel Corp. of the same nature as those presently outstanding. This is substantially equivalent to one share of common stock of the United States Steel Corp. for each five shares of common stock of the Atlas Portland Cement Co. now outstanding in the hands of the stockholders.

"The purchaser also offers, in connection with such purchase, to assume all the existing liabilities of the Atlas Portland Cement Co., so that as soon as practicable the shares of the United States Steel Corp. so received may be distributed pro rata among the stockholders of the Atlas Portland Cement Co.

"As the preferred stock of the Atlas Portland Cement Co. has all been retired, only the common stockholders of the Atlas Portland Cement Co. will share in such distribution. The directors all believe that the terms of the offer are favorable and that its acceptance would be advantageous to all of the stockholders and conducive to their best interests. They have voted to accept the offer if and when, in their discretion, a sufficient number of proxies have been received.

"The holders of a substantial majority of the stock of the Atlas Portland Cement Co. have already signified their intention to vote for the approval of the proposed plan.

"The company has been advised by counsel that this plan would constitute a 'reorganization,' within the meaning of the federal income tax law, and that the receipt of shares of the United States Steel Corp. pursuant to this plan would not result in federal income taxes to the stockholders, unless and until such shares should be subsequently sold."

Operations of the Atlas company will be merged into the Universal Portland Cement Co., which is the cement subsidiary of the steel corporation, according to the plan. Atlas and Universal are among the largest cement producers in the country. By combining these two organizations the steel corporation will become a potent factor in the cement industry.

Calaveras Cement Earnings

EARNINGS of the Calaveras Cement Co., San Ondreas, Calif., for nine months ended September 30, 1929, after depreciation, depletion and taxes amounted to $416,564, equivalent to $3.33 per share on 125,078 shares of common stock outstanding.

Canada Gypsum and Alabastine Earnings Reported Good

CANADA GYPSUM AND ALABASTINE, Ltd., following a series of expansions through consolidation and plant improvements, has become the leading manufacturer of gypsum and gypsum products in Canada. The company owns completely equipped gypsum manufacturing plants strategically situated across Canada and also gypsum quarries and mines convenient to the plants. Its manufacturing plants are operated at Montreal, Que.; Caledonia and Lythmore, Ont.; Winnipeg, Man.; and New Westminster, B. C.; and the deposits supplying these mills are located at Mabou, N. S.; Caledonia and Lythmore, Ont.; Gypsumville, Man., and Falkland, B. C. The company's alabastine manufacturing plant is located at Paris, in the heart of the Ontario market.

Completely equipped lime manufacturing plants are operated at Elora, Milton, Limehouse, Kelso, Beachville and Hespeler in Ontario, and through the recent acquisition of Standard Lime Co. of Quebe, will now include lime manufacturing plants at Joliette, St. Mark and Montreal and a sand-lime brick plant at the latter city in the Province of Quebec. Limestone quarries are situated adjacent to the plants.

Reports of sales and earnings for the nine months ending September 30, 1929, indicate approximately $950,000 (before income tax) as applicable to the common stock, exclusive of Standard Lime earnings, and giving effect to earnings from the recently acquired lime properties in Ontario for the half year only. With the inclusion of earnings from Standard Lime, together with the full year's earnings of the Ontario properties, and with the constantly increasing demand for the company's products, the year 1930 should show a substantial increase and consequent enhancement in the value of the common stock.

British Cement Products Loss

THE REPORT of the British Cement Products and Finance Co. discloses a loss of £282,000 and £1,782,000 depreciation investments against a previous year's profit of £251,000. The company is one, among several, of which H. S. Horne was chairman.

Arundel Corp. Prospects

THE Arundel Corp., Baltimore, Md., producer of sand and gravel and dredging contractor, has been conducting operations during the current year on a sharply increased scale. In October the company received a contract for the construction of a dam and power house for the new Pennsylvania Water and Power Co.'s hydro-electric development at Safe Harber, Penn., and in the last three weeks alone it has booked additional contracts approximating $3,000,000.

In some circles the opinion is expressed that for the year to end December 31, Arundel Corp. will report net income in the neighborhood of $2,000,000, equivalent to about $4 a share on the outstanding capital stock. For the nine months ended September 30 Arundel reported a net of $1,640,695, or $3.33 a share compared with $1,079,170, or $2.19 a share in the corresponding period of 1928. Earnings for the current year of approximately $2,000,000 will make 1929 the best year for the company in the last decade and will compare with 1928 earnings of $1,558,705, or $3.16 a share on the outstanding stock.

The following table gives the earnings for the past 10 years:

Year	*Net income	Earnings per share
1920	$ 149,804	$ 0.67
1921	546,605	5.23
1922	1,010,300	9.58
1923	726,801	6.70
1924	1,377,223	14.01
1925	1,166,817	2.37
1926	1,684,769	3.43
1927	1,953,640	3.97
1928	1,558,705	3.16
†1929	2,000,000	4.00

Earnings for years 1920 to 1924 inclusive are computed on $50 par stock. *After depreciation, depletion and Federal taxes. †Estimated.

During 1929 Arundel Corp. has paid $500,000 out of surplus for additional plant facilities and still has a cash balance of approximately $1,000,000.—*Wall St. News.*

Recent Dividends Announced

Canada Gypsum and Alabastine (qu.)	37½c	Jan. 2
Consolidated Rock Products pfd. (qu.)	43¾c	Dec. 1
Ideal Cement com. (qu.)	75c	Jan. 1
Ideal Cement com. spec. div., 50c and ext. div.	50c	Dec. 21
Limestone Prod. Corp. of Am. 7% pfd. (qu.)	$1	Jan. 1
Limestone Prod. Corp. of Am. 7% pfd. (qu.)	$1	Apr. 1
Marquette Cement Mfg. com. (semi-ann.)	5%	Jan. 1
Marquette Cement Mfg. pfd. (qu.)	1½%	Jan. 1
Newago Portland Cement 7% pfd. (qu.)	$1.75	Dec. 31

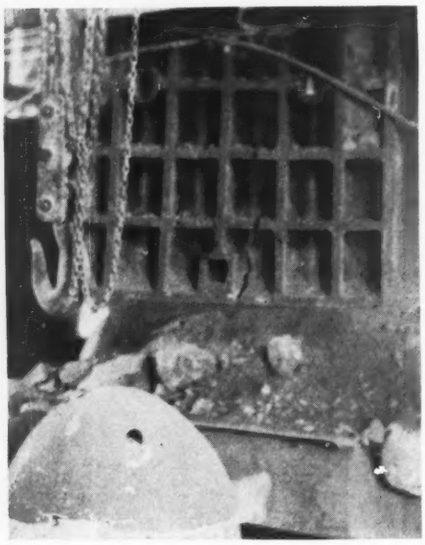
Sand-Lime Brick Association Convention in February

THE twenty-sixth annual convention of the Sand-Lime Brick Association will be held at the Hotel Pennsylvania, New York City, February, 4, 5 and 6, 1930.

Hints and Helps for Superintendents

Protection From Flying Rock

AT THE Amsterdam, N. Y., plant of the Cushing Stone Co., one of the secondary gyratory crushers is set somewhat below the feeding chute. Thus a sudden flow of stone through the chute might cause some of the rock to fly if it were not for a protector hung near the discharge end of the chute. This protector is an old breaker plate from the jaw crusher, suspended by wire cable, sufficiently above the crusher cap and far enough away from the chute not to interfere with operations. Flying rock hits against the plate and drops directly down into the mouth of the crusher. The plate is heavy enough to withstand the impact from extra large pieces of stone.



Old breaker plate protects from flying stone

Novel Tram Control Lever

AT the new crushing plant of the Olympic Portland Cement Co., near Sumas, Wash., a steep aerial tramway connects the crushing plant with the loading silo at the foot of the mountain. The lowering of the loaded bucket pulls up the empty one and it has been calculated that over 100 hp. of additional power is developed by the gravity tram. All of this must be absorbed by suitable brakes such as those provided.

The control lever used has a pad and the operator instead of pulling the lever with his hands leans with his back against the vertical arm, thereby controlling the tram's operation.

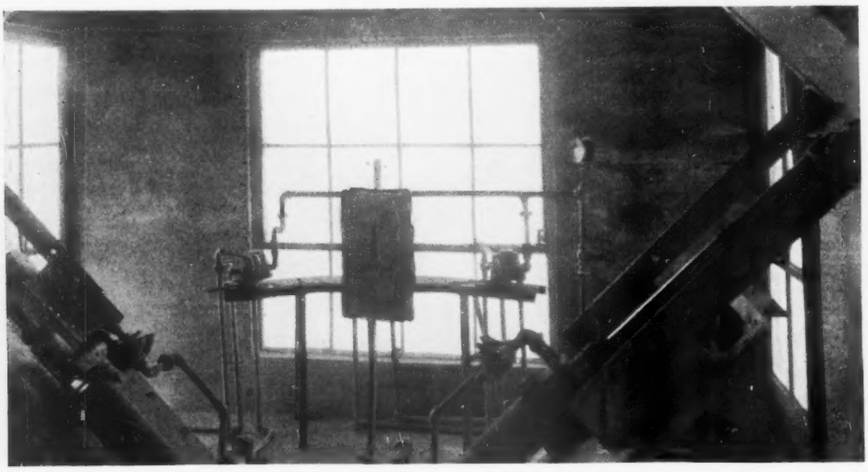
Sacking Acoustical Plaster

SACKING of acoustical plasters in the ordinary Bates packer is very difficult if the material of which the plaster is made has a pumice base or some such similar coarse porous aggregate. Such material will not flow in the tubes.

The plaster has to be mixed, and since only a limited tonnage at present was being shipped from this western mill where this photograph was taken, the installation of a separate mixer and hand packer was not advisable. Thus one of the regular plaster mixers was altered so as to be available for sacking acoustical plasters as well as ordinary plaster.

A short piece of screw conveyor and housing was attached to the back of the hopper feeding the Bates packer. The conveyor extended away from the mixer a sufficient distance so as to give plenty of room for the sacking crew. Three spouts are attached to the end of the conveyor from which either open-mouthed multi-walled paper or jute sacks can be filled. The conveyor is driven through chain drives from the mixer in conjunction with a jaw clutch.

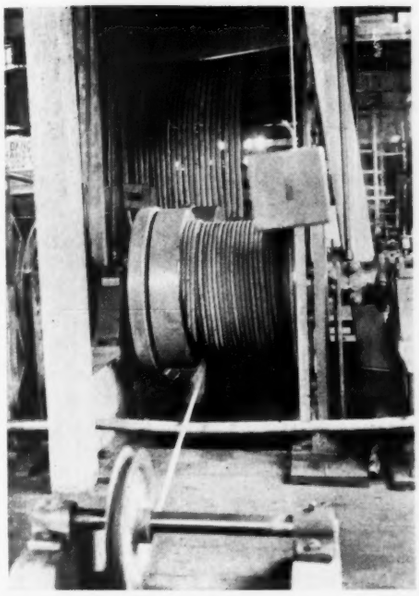
Device permits sacking of coarse-grained plaster by spout sackers



Leaning against a padded control lever operates the hoist brakes of the aerial tramway

Submarine Dredge Cables

THE Ross Island Sand and Gravel Co., Portland, Ore., uses a 12-in. suction dredge for delivery of sand and gravel to its washing plant. The dredge pump is direct-connected to a 250-hp. 2300-v. induction motor with electric power delivered to the boat by a submerged, lead covered, sub-



Lead-covered cable wire in reels on the deck of the dredge

marine cable. This is rather novel practice in itself as most dredges use a cable or three wires strung along on the pontoons carrying the dredge pump discharge pipe.

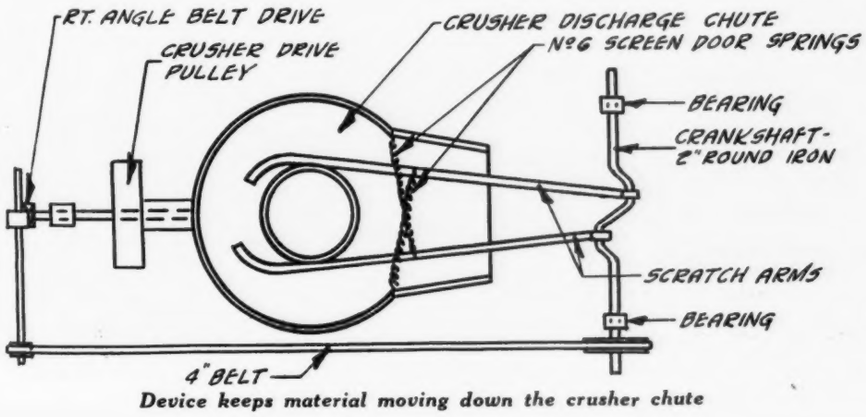
About 1000 ft. of the lead covered cable is carried on board the dredge neatly wound on a wooden drum so as the dredge is shifted from place to place the electric cable can be reeled in or out as desired.

"Scratcher" Keeps Material Moving Down Crusher Chute

By J. PALMER CAMM
Watonga, Okla.

AT OUR plant we employ the illustrated device (called a scratcher, for want of a better name) to keep the chutes clear of material. It can be applied to advantage on any chute of insufficient slope for the material to move freely.

Previous to our making this device, it was necessary for us to have a man to keep the rock moving down the crusher discharge chute, as this chute was on only a 35-deg. slope. The scratcher arms work, as shown in the sketch, off of a crank shaft. The reciprocating motion of the scratcher arms keeps the rock moving down the chute, enabling us to do away with one man's labor.



Device keeps material moving down the crusher chute

Elevator Housing

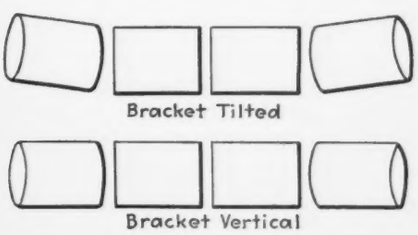
AT the Rolesville plant of the Raleigh Granite Co., this operation being just at the outskirts of Wake Forest, N. C., a large capacity is secured from a relatively small installation. The hand-loaded stone is dumped to one of two gyratory crushers which feed a 24-in. bucket elevator serving the screening plant. The elevator is working to capacity practically all of the time and to protect the workmen who feed the crusher from falling stone the bucket line is enclosed in a housing made of old discarded rotary screen sections. This protects the crusher operator who works near the boot of the elevator, and permits instant and frequent inspection of the moving parts.

Elevator housing of discarded screen sections

Inducing a Belt Conveyor to Run Straight

THE BELT of a belt conveyor sometimes exhibits a tendency to run off center. A remedy is simple, costs almost nothing, and is applicable to any kind of troughing idler, according to R. C. P. Phillips, assistant manager for the Beni Felkai Mining Company, Les Falaises, Algeria. It consists in driving steel wedges under the bracket of the troughing idlers, so as to make the set of idlers lean slightly forward in the direction of travel of the belt. Every set of idlers need not be treated thus, unless the trouble is serious. For a normal variation, about every third set suffices.

The amount of tilt given to the bracket is about 7 deg. from the vertical, as shown in the accompanying sketch. This is sufficient except under bad conditions, where it may be increased to 10 deg. Up to this point, no appreciable increased wear on the belt occurs.



Correcting misalignment in a belt conveyor

Reference to the plan of the set of idlers in the tilted position will make apparent the reason for the self-aligning action. Although the central horizontal idlers remain in the same line as before, the troughing idlers, by reason of their inclination, are now both looking slightly inward, and in consequence both tend continually to make the belt run inward, with the result that it keeps in the center.

Provision must be made to allow the front edge of the bracket to drop as the back edge is raised by the wedge, so that the horizontal idlers still remain at the original height. To make the reasoning more apparent, the angle of tilt in the drawing is purposely exaggerated, as the greater the tilt the more do the troughing idlers look inward.—*Engineering and Mining Journal.*

Graphite for Hot Bearings

THE value of deflocculated graphite as emergency lubricant for hot bearings is not fully appreciated, writes M. C. Landfelder in *Power*. A little graphite fed to the bearing so that the rotating shaft draws it in will frequently enable a hot bearing to cool down sufficiently to remain in service until attention may be given to it. About one-half of 1 per cent by bulk of graphite will usually be found sufficient.

Effect of Type of Coarse Aggregate on the Strength of Concrete

Discussion of Report of W. F. Kellermann, U. S. Bureau of Public Roads, Presenting the Case of Gravel Aggregates

By Stanton Walker

Director, Engineering and Research Division, National Sand and Gravel Association
Washington, D. C.

IN the December issue of the *National Sand and Gravel Bulletin* appears a full discussion of the report of W. F. Kellermann, originally published in the June issue of *Public Roads* (abstracted in ROCK PRODUCTS, July 6, 1929). What follows are brief extracts from my discussion there.

Comparisons of the quality of concrete made from several different aggregates do not tell an accurate story unless the aggregates have been proportioned in the most economical manner. In this discussion the endeavor has been made to compare the strengths obtained from the different aggregates by a method which, in so far as feasible from the data at hand, takes the most economical proportions into account by considering the different void contents of the aggregates.

If aggregates of different void contents are to be compared in concrete on the proper basis, the cement content per unit of volume of concrete and the quantity of mortar in relation to the voids in the coarse aggregate must be taken into consideration. There are two bases of comparison which suggest themselves as proper in the consideration of the relative merits of different coarse aggregates, and these are as follows:

1. For the same conditions of workability determine the cost of materials to produce concrete of a given strength.

2. For the same conditions of workability determine the relative strengths of concrete made from materials of a given cost.

Comparisons by the first method cannot be made readily from the data in Mr. Kellermann's paper. If differences in costs of aggregates are disregarded, the second method can be followed by basing the comparisons of concrete containing the *same cement content per unit of volume* with the *volume of mortar proportional to the void content of the coarse aggregate.*

Discussion of Mr. Kellermann's Conclusions

Mr. Kellermann has drawn four principal conclusions which include direct statements concerning the effect of type of aggregates on the strength of concrete. These conclusions and our discussion of them appear below:

1. *That the tensile, flexual and compressive strength of concrete are affected appreciably by the character of the coarse aggregate used.*

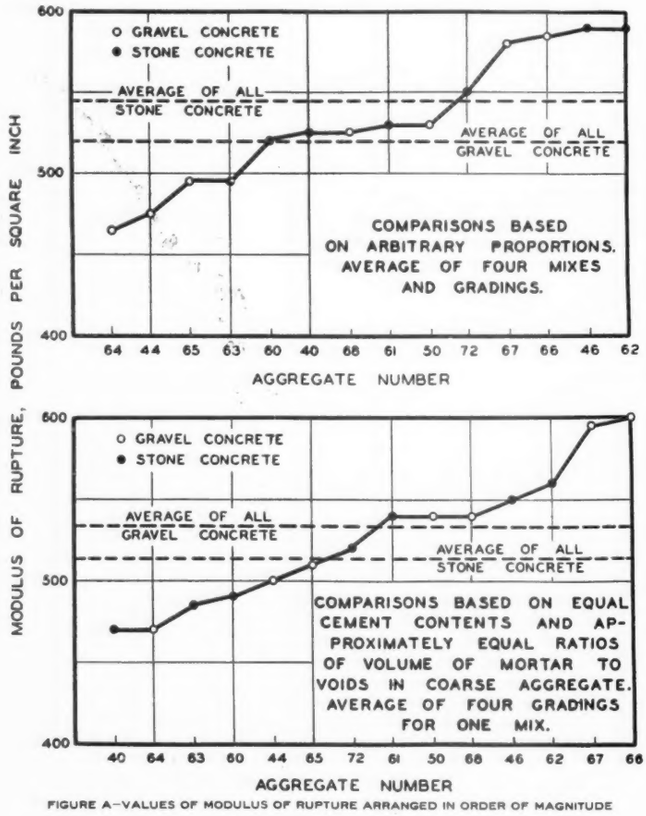

MODULUS OF RUPTURE, POUNDS PER SQUARE INCH
600
500
400
O GRAVEL CONCRETE
● STONE CONCRETE
AVERAGE OF ALL STONE CONCRETE
AVERAGE OF ALL GRAVEL CONCRETE
COMPARISONS BASED ON ARBITRARY PROPORTIONS. AVERAGE OF FOUR MIXES AND GRADINGS.
64 44 65 63 60 40 68 61 50 72 67 66 46 62
AGGREGATE NUMBER
MODULUS OF RUPTURE, POUNDS PER SQUARE INCH
600
500
400
O GRAVEL CONCRETE
● STONE CONCRETE
AVERAGE OF ALL GRAVEL CONCRETE
AVERAGE OF ALL STONE CONCRETE
COMPARISONS BASED ON EQUAL CEMENT CONTENTS AND APPROXIMATELY EQUAL RATIOS OF VOLUME OF MORTAR TO VOIDS IN COARSE AGGREGATE. AVERAGE OF FOUR GRADINGS FOR ONE MIX.
40 64 63 60 44 65 72 61 50 68 46 62 67 66
AGGREGATE NUMBER

FIGURE A—VALUES OF MODULUS OF RUPTURE ARRANGED IN ORDER OF MAGNITUDE

Fig. A—Based on same data, but differently arranged, as in Table 5 of Kellermann's report. Each value is average of four gradings of coarse aggregate and four arbitrary proportions

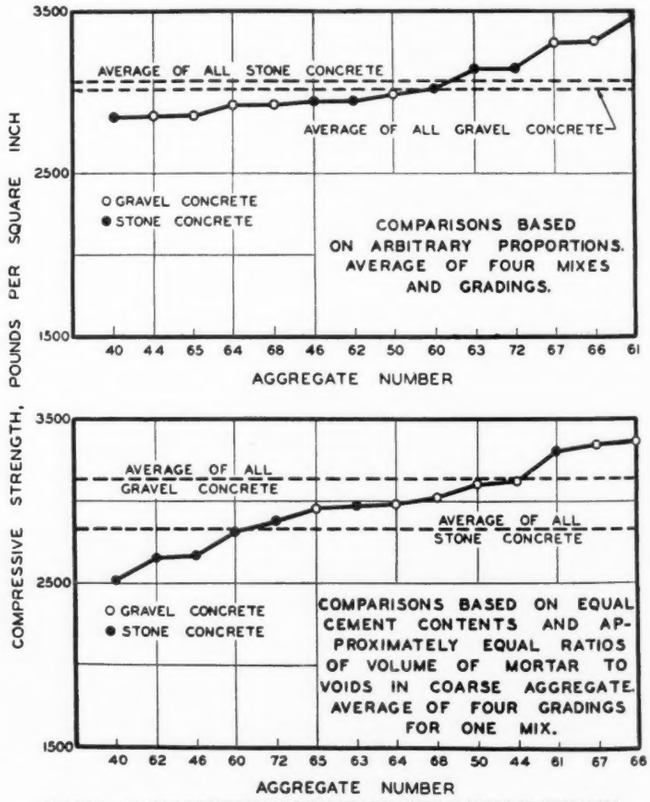

COMPRESSIVE STRENGTH, POUNDS PER SQUARE INCH
3500
2500
1500
AVERAGE OF ALL STONE CONCRETE
AVERAGE OF ALL GRAVEL CONCRETE
O GRAVEL CONCRETE
● STONE CONCRETE
COMPARISONS BASED ON ARBITRARY PROPORTIONS. AVERAGE OF FOUR MIXES AND GRADINGS.
40 44 65 64 68 46 62 50 60 63 72 67 66 61
AGGREGATE NUMBER
COMPRESSIVE STRENGTH, POUNDS PER SQUARE INCH
3500
2500
1500
AVERAGE OF ALL GRAVEL CONCRETE
AVERAGE OF ALL STONE CONCRETE
O GRAVEL CONCRETE
● STONE CONCRETE
COMPARISONS BASED ON EQUAL CEMENT CONTENTS AND APPROXIMATELY EQUAL RATIOS OF VOLUME OF MORTAR TO VOIDS IN COARSE AGGREGATE. AVERAGE OF FOUR GRADINGS FOR ONE MIX.
40 62 46 60 72 65 63 64 68 50 44 61 67 66
AGGREGATE NUMBER

FIGURE B—VALUES OF COMPRESSIVE STRENGTH ARRANGED IN ORDER OF MAGNITUDE

Fig. B—Comparisons of 1-1.6-4 gravel concrete and 1-2-4 stone concrete. Data arranged from Table 6 of Kellermann's report. Each value is average of tests for four different gradings of coarse aggregate

While a study of the data on the basis outlined above substantiates this general conclusion it also brings out that the effects of aggregate characteristics are not always the same as Mr. Kellermann's interpretation of the data has led him to believe.

For example, the average modulus of rupture of all of the gravel concrete in Mr. Kellermann's Table 5 and Fig. 3 will be found to be lower than that of the concrete made with crushed stone. When the comparisons are made on the basis of the same cement content and with consideration given to the volume of mortar, it will be seen that the gravel concrete averages higher than the stone.

Other comparisons of a similar nature may be made for the other aggregates and for the other types of tests.

2. That the tensile and flexual strength are affected to a greater extent than the compressive strength.

This conclusion is not borne out by the test results if all factors are taken into consideration; the compressive strengths found for the different aggregates differs by as great an amount as either the tensile or flexural strengths.

This is made clear by Figs. A, B and C (shown herewith). It will be seen that the high and low value of each type of test are as follows:

	Low	High	Percent Difference
Modulus of rupture.....	470	600	27.7
Tensile strength.....	185	250	35.0
Compressive strength....	2520	3360	33.3

It will be noted that the range for compressive strength is slightly higher than for the flexural strength and about the same as for tensile strength. It may be said that these percentages are based on two single values and, therefore, may be somewhat erratic. To check them it is of interest to compare the average slopes of lines in the lower diagrams in Figs. A, B and C. These give an arbitrary comparison of the same nature and show the following percentages of range from low to high:

Modulus of rupture	30.0
Tensile strength	35.0
Compressive strength	35.0

These comparisons involve different aggregates; that is, the high and low values are not for the same two aggregates for each type of test. Comparisons involving the same aggregates are of interest and are given in the following:

	Average of Aggregates Nos. 40-60	Nos. 66-67	Difference in Percent
Modulus of rupture.....	480	600	25.0
Tensile strength.....	205	250	22.0
Compressive strength....	2660	3350	26.0

Similar comparisons between other groups will show similar results.

5. That there is a fairly definite relation between certain mineralogical characteristics of the coarse aggregate and the strength of concrete, calcareous aggregates in general giving consistently higher flexural and tensile strength than siliceous aggregates.

When the comparisons are based on concretes with equal cement contents and ratios of mortar to voids in coarse aggregate it seems evident that the strength was influenced by other factors as greatly as by mineral composition. The following comparisons are of interest in this connection: (1) The two high-grade crushed limestones (Nos. 46 and 62) gave only slightly higher flexural strengths than two siliceous gravels (Nos. 50 and 68). (2) Two soft limestones gave lower strengths than a soft sandstone. (3) Three siliceous gravels gave strengths uniformly lower than two other siliceous gravels. (4) Two calcareous gravels gave strengths higher than the two high-grade crushed limestones. (5) Two hard and tough igneous rocks gave strengths lower than any of the groups of aggregates.

6. That, in general, aggregates having rounded fragments produce concrete of lower flexural and tensile strength than aggregates which are composed wholly or in part of crushed fragments.

There may be some question as to whether this conclusion is justified from the test results, even when the comparisons are made by the method followed by Mr. Kellermann. When comparisons are made by the method outlined in this discussion, what little evidence there is on the question indicates that at least as high strengths will be obtained from the rounded materials as from the angular ones if other conditions are maintained the same.

No difference in strength is indicated for different percentages of crushed particles in similar gravels. The two calcareous gravels were similar in nature and contained widely dfiferent amounts of crushed materials, but the strengths were essentially the same. Attention is also directed to the fact that the crushed particles of gravel did not affect the voids to a great extent. This only serves to emphasize that a particle of gravel with one or two crushed faces is much more nearly the same as a rounded particle than a piece of crushed stone.

If the high-grade crushed limestones and the calcareous gravels may be considered similar except for the shape of particle, the tests indicate an advantage for the rounded particles. A similar conclusion may be drawn from a comparison of the igneous stones and the siliceous gravels or from a comparison of the average of all of the gravels and all of the stones.

The following conclusions are drawn in Mr. Kellermann's paper which do not bear directly on the effect of type of aggregate:

3. That for a given aggregate there is a fairly well-defined relation between the strength of the concrete and the water-cement ratio.

4. That variations in the character of the coarse aggregates, other things being equal, may result in a difference in flexural strength equal to that produced by an appreciable change in the water-cement ratio with any given aggregate. (In this study, for instance, aggregate No. 46, with a water-cement ratio of 0.94, produced concrete of a somewhat higher flexural strength than aggregate No. 44, with a water-cement ratio of 0.74—a difference of 0.2).

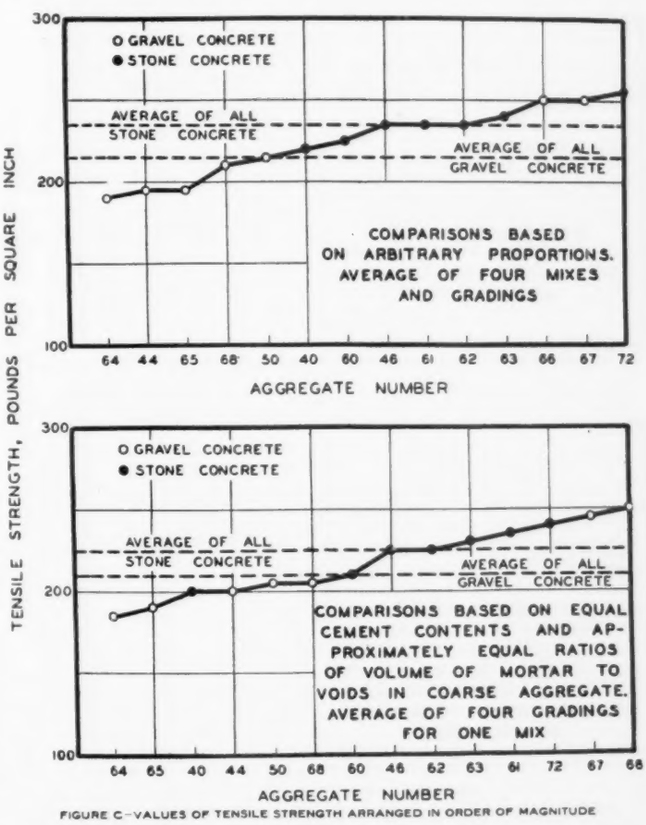

O GRAVEL CONCRETE
● STONE CONCRETE
AVERAGE OF ALL STONE CONCRETE
AVERAGE OF ALL GRAVEL CONCRETE
COMPARISONS BASED ON ARBITRARY PROPORTIONS. AVERAGE OF FOUR MIXES AND GRADINGS
TENSILE STRENGTH, POUNDS PER SQUARE INCH
300
200
100
64 44 65 68 50 40 60 46 61 62 63 66 67 72
AGGREGATE NUMBER
O GRAVEL CONCRETE
● STONE CONCRETE
AVERAGE OF ALL STONE CONCRETE
AVERAGE OF ALL GRAVEL CONCRETE
COMPARISONS BASED ON EQUAL CEMENT CONTENTS AND APPROXIMATELY EQUAL RATIOS OF VOLUME OF MORTAR TO VOIDS IN COARSE AGGREGATE. AVERAGE OF FOUR GRADINGS FOR ONE MIX
300
200
100
64 65 40 44 50 68 60 46 62 63 61 72 67 66
AGGREGATE NUMBER

FIGURE C—VALUES OF TENSILE STRENGTH ARRANGED IN ORDER OF MAGNITUDE

Fig. C—Comparisons of different aggregates in concrete based on uniform cement content and uniform ratio of volume of mortar to voids in coarse aggregates. Values computed from data in Table 6 of Kellerman's report. Cement content 5.62 bags per cu. yd. of concrete. Volume of mortar approximately 170% of volume of voids in coarse aggregate. Each value based on average of tests for four different gradings of coarse aggregate

7. That, within the limits of this study, variations in grading of coarse aggregates have no consistent effect upon the strength of concrete. (It is not to be inferred from this statement, however, that control of grading is not important. Variations in grading occurring during construction not only affect yield when measurements are made by volume, but also affect the workability and therefore the uniformity of the concrete.)

8. That, within the range in quality covered by this study, there is no relation between the quality of the coarse aggregate, as measured by the abrasion test, and the strength of the concrete.

My Own Conclusions

1. Comparisons of the concrete making properties of different aggregates should be made only in the light of careful consideration of the quantity of cement per unit of volume of concrete and the amount of mortar required to produce workability. Comparisons based on arbitrary mixtures by volume lead to erroneous conclusions.

2. If the same quantity of cement per unit of volume of concrete and a volume of mortar in proportion to the voids in the coarse aggregate are used in the concrete, flexural strengths obtained using aggregates with rounded particles are at least as high as those obtained with angular particles.

3. If the cement content and volume of mortar are taken into consideration as suggested in No. 2 above, the compressive strength of concrete made with coarse aggregate consisting of rounded particles generally will be higher than that of concrete made with angular particles.

4. While the preponderance of evidence indicates rather wide variations in the flexural strength of concrete made from different aggregates it is not believed that available information definitely identifies the factors causing these variations.

5. When the cement and mortar content are taken into account the compressive strength is found to be affected by the type of aggregate at least as greatly as the flexural strength.

Comment on Walker's Analysis of the Bureau of Public Roads Tests

By Edmund Shaw
Contributing Editor, Rock Products

IN THE above analysis Mr. Walker has compared figures from two different series of the Bureau of Public Roads tests, while figures from the same test are compared in the bureau's report. He claims that the figures taken from two series are more comparable, first, because the cement contents are more nearly equal, and second, because the mortar volumes are more nearly in the same proportion to the voids in the coarse aggregates. Afterwards he calculates to what they would be if exactly the same quantity of cement had been used in all of them. The figures are in no dispute. The only question that can be raised is that of his right to do this in the light of what is known about concrete and concrete testing. In other words, has he any weight of authority to sustain him in making such a comparison?

The writer's opinion is that he has. The avowed purpose of the Bureau of Public Roads tests was to "determine the effect of type of coarse aggregate on the flexural strength of concrete. What was *actually* determined was the flexural strengths of concretes made by arbitrary proportions from various types of coarse aggregate, in order to compare concrete pavements as customarily constructed.

Everyone who has studied concrete recognizes that any set of arbitrary proportions must favor one type of aggregate more than another. For example, it is now generally admitted that a crushed-stone coarse aggregate requires more sand in the mix than a gravel aggregate. Both the Bureau of Public Roads and the National Crushed Stone Association have recommended the use of more sand with crushed stone. Hence, any set of arbitrary and identical proportions that had the right amount of sand for crushed stone would not have the right amount of gravel, and vice versa.

The single conclusion that A. T. Goldbeck was able to draw from his first series of comparative tests on stone and gravel concretes was that identical proportions should not be used with different types of aggregates as such use "results in widely varying values for modulus of rupture and this causes lack of economy, considerable variation in the service value of road slabs and inequitable competition among the several aggregates."

Whatever authority there is on the point is to the effect that identically proportioned concretes with different aggregates cannot be equitably compared. Hence, Mr. Walker was justified in comparing figures from different series if in this way he could find figures that in his opinion were more equitable than those in any one series.

The claim that the series chosen were more nearly equitable because the cement contents were more nearly equal will hardly be disputed by those who believe cement economy is the prime consideration. If the effect of aggregates only on strength is to be compared, and not the adaptability of the aggregates to some particular mixture, the cement contents should be the same.

But the contention that "the quantity of mortar in relation to the voids in the coarse aggregate must be taken into consideration" may be new to some readers.

However, it is not new in theory, and the necessity for such consideration has been pointed out by several investigators. It is the basis for Prof. Talbot's formula for finding the amount of coarse aggregate to be used in concrete, $b = 0.77 b_0$, because b_0 is the volume of solids in a cubic foot of the coarse aggregate, and this, of course, depends upon the percentage of voids. It was this formula which was used by A. T. Goldbeck in his second series of comparative tests.

Quite recently, C. C. Gray, district manager of the American Aggregates Corp. and former chief engineer of the Indiana State Highway Commission, has proposed a concrete specification which includes a formula the use of which will always make the volume of mortar 160% of the voids in the coarse aggregate.

E. R. Kendall and Clifford R. Foster, both of the Michigan State Highway department, have published data which bear on the subject. The latter, who is chief engineer of the Michigan department, says that field tests show that "gravel aggregate produces a higher modulus of rupture than crushed stone aggregate when the designs for these two aggregates are based upon the same yield per sack of cement and with the same provision for excess mortar." (That is, mortar in excess of that required to fill the voids in the coarse aggregates.) This has not been the general experience with concretes made with identical proportions.

The design of concrete for flexural strength is being studied by one of the subcommittees of the concrete committee of the American Society for Testing Materials, and one of the methods to be studied is that of designing by the voids-mortar theory.

For the reasons given, in the writer's opinion, Mr. Walker had ample authority for comparing the figures in the report as he did. There remains to consider his method of computing what the strengths of the concretes would be if they had had exactly the same cement contents. The writer sees no objection to the method used, since the figures which show the increase of strength for each percent. of increase in cement are found from the actual results of the tests.

However, the whole case would be stronger if the analysis were to be backed up by some experimental work showing actual results with different types of aggregates made into concretes with equal cement contents and equal proportions of mortar volumes to voids, as compared to concretes made with the usual identical proportions.

New Method of Designing Pavement Concrete

THE EXPERIMENTAL WORK of the past year or two which showed how the flexural and tensile strength of concrete is affected by the character of the aggregates used is bound in time to be used in specifications. In a recent issue of *Public Roads*, F. H. Jackson, senior engineer of tests of the United States Bureau of Public Roads, which takes the character of the aggregates used into account, although it is based on the water-cement ratio of Abrams.

Changes Based on Economy

Mr. Jackson admits that the present method of arbitrary proportioning has produced good paving concrete, but he justifies the change to another method on the ground of economy. It is certainly a scientific method that he proposes, but it will be limited in its application to highways and other large works that can stand the expense. For a well equipped laboratory with a qualified concrete testing engineer in charge is necessary for its aplication. He says that we have not yet reached the point where we can discard actual tests of trial mixtures in favor of mathematical formulas in the design of concrete mixtures.

The first step in the method is tocide the proper ratio in which to combine the available fine and coarse aggregates. He gives four general rules for this:

(1) The proportion of sand should be increased as the sand becomes coarser.

(2) The proportion of sand should be increased as the maximum size of the coarse aggregate becomes smaller.

(3) The proportion of sand should be increased as the percentage of fine material in the coarse aggregate becomes smaller.

(4) The proportion of sand should be increased as the percentage of angular fragments in the coarse aggregate becomes larger.

Ideal Combinations of Aggregates

These, the paper says, are well known principles, although the usual concrete specifications hardly recognize them. The important point to remember is that a balance must be struck between a high-sanded mix, which is workable but apt to be uneconomical, requiring more cement for a given water-cement ratio, and a low sanded mix which may be more economical but is apt to give trouble in placing.

In his opinion, "the ideal combination is the one in which the voids in the coarse aggregate are maintained at a minimum, so as to permit the use of the smallest amount of mortar possible and still have a workable mix. In order to do this the grading of the coarse aggregate must be very carefully controlled throughout the entire job, and this can best be done by handling and measuring it in separate sizes. . . . In general, there is no reason for using more mortar than is necessary to secure the proper finish. Under such a condition it will usually be found that there is enough mortar present to fill the voids in the coarse aggregate with a slight excess and it is believed that under our modern methods of finishing this will prove sufficient . . . to secure a dense homogeneous concrete, free from honeycomb."

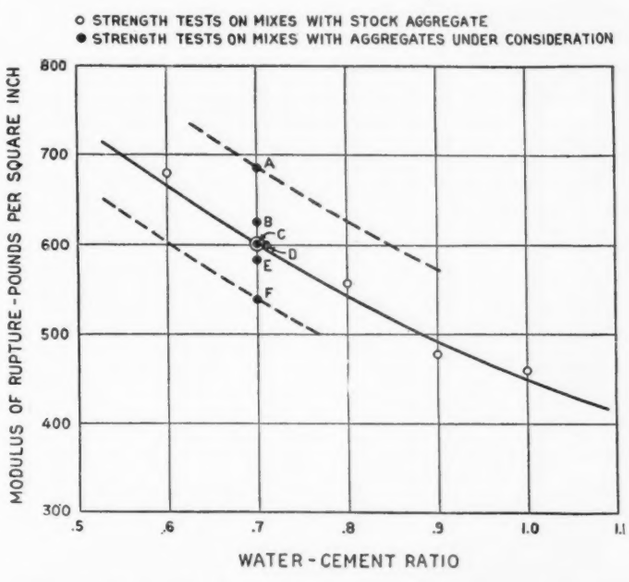


Fig. 1. Strength of concrete made with stock aggregates and on mixes with aggregates under consideration

As a guide for preliminary tests to secure these things, the following table is offered:

TABLE 1. APPROXIMATE RATIOS, BY VOLUME, OF FINE TO COARSE AGGREGATE FOR PAVING CONCRETE, MACHINE FINISHED

Coarse aggregate size limits	Fine aggregate size limits 0-No. 16	0-No. 8	0-No. 4	0-⅜-in.
No. 4 to ¾-in.	35:65	37:63	40:60	45:55
No. 4 to 1-in.	30:70	32:68	35:65	40:60
No. 4 to 2-in.	25:75	27:73	30:70	35:65

The next step is to determine the cement needed. To do this samples of the cement chosen are mixed with *stock* aggregates, using water-cement ratios varying with a constant increment, as 0.6, 0.7, 0.8, 0.9 and 1.0. The flexural strength (modulus of rupture) at 28 days is found by testing and plotted as on the heavy line shown in Fig. 1. Assuming that a modulus of rupture of 600 lb. is required by the specifications, this requirement is shown by the plot (Fig. 1) to be satisfied with a water-cement ratio of 0.7.

Concrete specimens are now made up with the cement chosen and the aggregate combinations previously worked out, using a water-cement ratio of 0.7. It is assumed for illustration that the results are those given in the following table:

Combination	Modulus of rupture lb./sq. in.	Combination	Modulus of rupture lb./sq. in.
A	670	D	600
B	625	E	580
C	600	F	535

These values are plotted in Fig. 1 (the solid circles). Four of them have strengths practically identical with that of the laboratory combination. Two, A and F, are, one much higher, the other much lower. It is assumed that the curves passing through them, parallel to the heavy line, represent the strengths with the different water-cement ratios indicated.

These curves show that the modulus of rupture required may be obtained from A with a water-cement ratio of 0.85 and from F with a water-cement ratio of 0.60. A works out to a 1:2:4 proportioning by volume and F to a 1:1½:3. Whichever will be the cheaper will depend on the cost of aggregate delivered on the job.

Cost Comparison

In the original paper the costs are worked out for the two combinations, A and F. Briefly stated, the method is first to find the quantities of material required by the well known formula of Stanton Walker (given in Bulletin No. 1 of the National Sand and Gravel Association). The quantities are then multiplied by the unit costs to give a total representing the cost of a cubic yard. For A the costs are:

Cement, 5.6 bags, at $0.60	$3.36
Fine aggregate, 0.505 ton, at $1.75	.88
Coarse aggregate, 1.065 tons, at $2	2.13
Cost of materials per cubic yard of concrete	$6.37

And for F the costs are:

Cement, 7.16 bags, at $0.60	$4.30
Fine aggregate, 0.429 tons, at $1	.43
Coarse aggregate, 1.17 tons, at $1	1.18
Cost of materials per cubic yard of concrete	$5.91

Which, the paper notes, shows that the cheapest concrete is not always that containing the least cement.

If this method of designing is adopted, the methods of bidding, the paper notes, will have to be changed. One way will be to make the engineer in charge responsible for the concrete and to take separate bids for the material and for the labor of mixing and placing. The other will be to specify only the (flexural) strength required.

Portland Cement Output in November

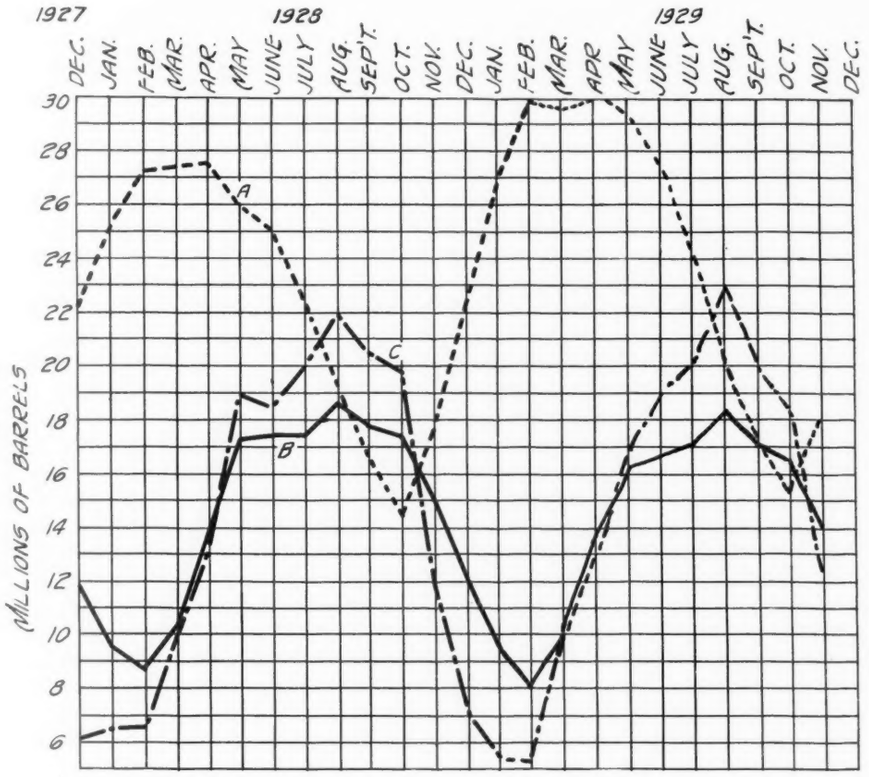
THE PORTLAND cement industry in November, 1929, produced 14,036,000 bbl., shipped 11,205,000 bbl. from the mills, and had in stock at the end of the month 18,213,000 bbl., according to the United States Bureau of Mines, Department of Commerce. The production of portland cement in November, 1929, showed a decrease of 6.8% and shipments a decrease of 6.2% as compared with November, 1928. Portland cement stocks at the mills were 2.5% higher than a year ago.

The statistics here presented are compiled from reports for November, from all manufacturing plants except two for which estimates have been included in lieu of actual returns.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 165 plants at the close of November, 1929, and of 159 plants at the close of November, 1928. In addition to the capacity of the new plants which began operating during the twelve months ended November 30, 1929, the estimates include increased capacity due to extensions and improvements at several old plants during the period.

RELATION OF PRODUCTION TO CAPACITY

	Nov. 1928 Pct.	Nov. 1929 Pct.	Oct. 1929 Pct.	Sept. 1929 Pct.	Aug. 1929 Pct.
The month	77.4	66.6	77.0	81.8	86.1
12 months ended	74.1	66.8	67.3	67.5	68.2


1927
1928
1929
DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEP'T. OCT. NOV. DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEP'T. OCT. NOV. DEC.
30 28 26 24 22 20 18 16 14 12 10 8 6
MILLIONS OF BARRELS
A
B
C

(A) Stocks of finished portland cement at factories; (B) Production of finished portland cement; (C) Shipments of finished portland cement from factories

Distribution of Cement

The following figures show shipments from portland cement mills distributed among the states to which cement was shipped during September and October, 1928 and 1929.

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES IN SEPTEMBER AND OCTOBER, 1928 AND 1929, IN BARRELS*

Shipped to—	1928—Sept.—	1929	1928—Oct.—	1929
Shipped to—	1928—Sept.—	1929	1928—Oct.—	1929
Alabama	255,120	179,011	226,835	172,980
Alaska	277	282	132	662
Arizona	56,940	56,000	60,063	52,544
Arkansas	136,794	206,476	126,798	190,656
California	1,020,406	915,829	1,145,337	1,075,308
Colorado	140,150	91,602	114,600	97,352
Connecticut	233,257	206,737	259,374	229,221
Delaware	34,578	34,281	73,582	36,005
District of Columbia	81,703	107,654	133,450	104,051
Georgia	155,421	117,262	180,537	124,215
Florida	98,859	88,730	142,911	106,271
Hawaii	21,378	24,896	34,436	22,716
Idaho	30,886	27,375	28,253	28,709
Illinois	2,553,958	1,721,624	2,127,381	1,406,895
Indiana	847,440	909,295	658,331	686,986
Iowa	738,450	968,958	442,740	716,047
Kansas	272,461	332,819	316,943	336,060
Kentucky	211,690	176,115	203,725	178,287
Louisiana	112,202	171,673	106,819	245,643
Maine	79,289	94,201	72,694	80,564
Maryland	227,573	294,089	307,849	291,625
Massachusetts	315,939	356,318	337,880	365,195
Michigan	1,692,432	1,601,684	1,449,956	1,161,054
Minnesota	377,096	430,298	306,698	352,958
Mississippi	129,970	107,651	133,253	99,934
Missouri	554,767	748,870	583,508	681,598
Montana	59,124	77,505	52,977	55,468
Nebraska	159,659	224,168	174,041	213,158
Nevada	13,635	14,180	9,954	15,028
New Hampshire	72,947	75,573	73,003	67,001
New Jersey	884,759	825,204	1,064,536	911,203
New Mexico	27,552	21,621	37,837	28,479
New York	2,398,193	2,237,801	2,445,879	2,295,014
North Carolina	167,910	129,411	238,528	147,399
North Dakota	43,739	49,597	41,390	42,474
Ohio	1,410,196	1,207,197	1,312,086	1,218,439
Oklahoma	361,360	365,927	314,273	376,193
Oregon	132,521	122,669	120,863	114,228
Pennsylvania	1,519,073	1,632,356	1,651,472	1,550,799
Porto Rico	500	4,190	0	5,195
Rhode Island	77,316	81,919	87,953	78,405
South Carolina	108,575	64,446	154,004	88,492
South Dakota	58,274	83,173	52,621	94,859
Tennessee	353,282	358,182	344,413	358,340
Texas	515,419	697,091	564,578	759,309
Utah	49,468	73,952	51,793	60,619
Vermont	108,095	135,894	107,388	109,422
Virginia	173,104	161,521	220,617	152,804
Washington	291,994	305,056	261,412	240,543
West Virginia	166,816	164,543	170,134	168,957
Wisconsin	791,171	759,187	622,618	597,697
Wyoming	27,555	24,015	17,682	28,708
Unspecified	41,593	22,207	11,413	0
	20,392,866	19,888,315	19,777,550	18,621,769
Foreign countries	67,134	61,685	58,450	73,231
Total shipped from cement plants	20,460,000	19,950,000	19,836,000	18,695,000

*Includes estimated distribution of shipments from three plants each month.

PRODUCTION AND STOCKS OF CLINKER, BY MONTHS, IN 1928 AND 1929, IN BARRELS

Month	1928—Production—	1929	Stock at end of month 1928	1929
January	11,839,000	12,041,000	9,672,000	9,642,000
February	11,363,000	11,255,000	12,237,000	12,436,000
March	12,501,000	12,450,000	14,463,000	14,948,000
April	13,844,000	14,166,000	16,002,000	15,472,000
May	16,025,000	15,445,000	14,329,000	14,911,000
June	15,940,000	15,312,000	12,944,000	13,586,000
July	15,981,000	15,180,000	11,707,000	11,619,000
August	16,202,000	15,822,000	9,357,000	8,989,000
September	15,909,000	15,147,000	7,566,000	6,985,000
October	15,782,000	15,520,000	5,944,000	*5,915,000
November	14,930,000	14,073,000	5,953,000	6,105,000
December	13,426,000	.....	7,422,000	.....

*Revised.

†The inclusion of Wyoming begins with April, 1929; of Idaho, with June, 1929; of Arkansas, with September, 1929.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN NOVEMBER, 1928 AND 1929, AND STOCKS IN OCTOBER, 1929, IN BARRELS

District	Production 1928—Nov.—1929		Shipments 1928—Nov.—1929		Stocks at end of month 1928	1929	Stocks at end of Oct. 1929*
Eastern Penn., N. J. & Md.	3,338,000	2,956,000	3,153,000	2,932,000	4,251,000	4,024,000	4,000,000
New York and Maine	962,000	848,000	725,000	738,000	1,339,000	1,107,000	996,000
Ohio, Western Penn., W.Va.	1,587,000	1,537,000	1,133,000	1,197,000	2,439,000	2,580,000	2,240,000
Michigan	1,409,000	1,228,000	811,000	667,000	1,355,000	1,636,000	1,075,000
Wis., Ill., Ind. and Ky.	1,973,000	1,760,000	1,272,000	1,219,000	1,629,000	1,869,000	1,329,000
Va.,Tenn., Ala., Ga., Fla., La.	1,413,000	1,085,000	1,350,000	1,025,000	1,683,000	1,557,000	1,498,000
East'n Mo., Ia., Minn., S.D.	1,283,000	1,344,000	777,000	742,000	1,972,000	1,876,000	1,273,000
West'n Mo., Neb., Kan., Okla. and Ark.†	884,000	1,176,000	726,000	788,000	1,150,000	1,009,000	621,000
Texas	529,000	661,000	451,000	523,000	424,000	665,000	527,000
Colo., Mont., Utah, Wyo.,† and Idaho†	238,000	120,000	145,000	119,000	398,000	453,000	451,000
California	1,173,000	1,091,000	1,103,000	1,038,000	757,000	989,000	937,000
Oregon and Washington	279,000	230,000	305,000	217,000	372,000	448,000	434,000
	15,068,000	14,036,000	11,951,000	11,205,000	17,769,000	18,213,000	15,381,000

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1928 AND 1929, IN BARRELS

Month	1928—Production—1929		1928—Shipments—1929		Stocks at end of month 1928	1929
January	9,768,000	9,881,000	6,541,000	5,707,000	25,116,000	26,797,000
February	8,797,000	8,522,000	6,563,000	5,448,000	27,349,000	29,870,000
March	10,223,000	9,969,000	10,135,000	10,113,000	27,445,000	29,724,000
April	13,468,000	13,750,000	13,307,000	13,325,000	27,627,000	30,151,000
May	17,308,000	16,151,000	18,986,000	16,706,000	25,984,000	29,624,000
June	17,497,000	16,803,000	18,421,000	18,949,000	25,029,000	27,457,000
July	17,474,000	17,281,000	19,901,000	20,295,000	22,580,000	24,525,000
August	18,759,000	18,585,000	21,970,000	23,052,000	19,374,000	20,056,000
September	17,884,000	17,223,000	20,460,000	19,950,000	16,799,000	17,325,000
October	17,533,000	16,731,000	19,836,000	18,695,000	14,579,000	*15,381,000
November	15,068,000	14,036,000	11,951,000	11,205,000	17,769,000	18,213,000
December	12,189,000	.....	7,384,000	.....	22,918,000	.....
	175,968,000	.....	175,455,000	.....	.....	.....

PRODUCTION AND STOCKS OF CLINKER (UNGROUND CEMENT), BY DISTRICTS, IN NOVEMBER, 1928 AND 1929, IN BARRELS

District	Production 1928	1929	Stocks at end of month 1928	1929
Eastern Pennsylvania, New Jersey and Maryland	3,151,000	2,804,000	702,000	876,000
New York and Maine	1,035,000	935,000	724,000	539,000
Ohio, Western Pennsylvania and West Virginia	1,568,000	1,577,000	528,000	537,000
Michigan	1,291,000	1,255,000	440,000	502,000
Wisconsin, Illinois, Indiana and Kentucky	2,029,000	1,840,000	283,000	442,000
Virginia, Tennessee, Alabama, Georgia, Florida, Louisiana	1,409,000	1,066,000	722,000	598,000
Eastern Missouri, Iowa, Minnesota and South Dakota	1,325,000	1,260,000	350,000	430,000
West'n Missouri, Nebraska, Kansas, Oklahoma, Arkansas†	915,000	1,147,000	338,000	166,000
Texas	540,000	731,000	131,000	372,000
Colorado, Montana, Utah, Wyoming† and Idaho†	243,000	119,000	321,000	273,000
California	1,157,000	1,088,000	1,143,000	945,000
Oregon and Washington	267,000	251,000	271,000	425,000
	14,930,000	14,073,000	5,953,000	6,105,000

Exports and Imports

(Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision)

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII AND PORTO RICO, IN OCTOBER, 1929

	Barrels	Value
Alaska	859	$ 2,581
Hawaii	23,346	57,396
Porto Rico	5,931	12,387
	30,136	$72,364

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN OCTOBER, 1929

Imports from	District into which imported	Barrels	Value
Belgium	Los Angeles	89,054	$52,572
	Massachusetts	5,646	6,410
	New York	97	202
	Porto Rico	15,203	23,616
	Total	110,000	$82,800
Canada	Alaska	40	$182
	Duluth-Superior	9	23
	Maine and N. H.	131	146
	Vermont	6	15
	Total	186	$366
Denmark	Los Angeles	100	$255
	Maryland	3,489	7,000
	Porto Rico	22,800	33,771
	Total	26,389	$41,026
France	Massachusetts	1,000	$1,216
	New York	1,492	3,033
	Total	2,492	$4,249
Germany	Los Angeles	2,250	$4.226
	San Francisco	250	532
	Total	2,500	$4,758
United K'gd'm.	New Orleans	501	$760
	New York	30,498	53,545
	Total	30,999	$54,305
	Grand total	172,566	$187,504

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN OCTOBER, 1929

Exported to—	Barrels	Value
Canada	5,318	$ 23,215
Central America	17,018	39,146
Cuba	6,301	16,548
Other West Indies and Bermuda	6,295	13,728
Mexico	28,259	87,860
South America	33,424	128,939
Other countries	4,744	28,403
	101,359	$337,839

Canadian Cement Production Increases in 1928

CEMENT production in Canada during 1928 established a new high record at 11,023,928 bbl., valued at $16,739,163, marking an advance of 9.5% in quantity and 16.3% in value over the 1927 shipments of 10,065,865 bbl. worth $14,391,937, according to finally revised statistics just issued by the mining, metallurgical and chemical branch of the Dominion Bureau of Statistics.

The total Canadian output was obtained from plants in Quebec, Ontario, Manitoba, Alberta and British Columbia. Quebec mills accounted for 44.6% of the total Canadian production; Ontario mills contributed 35.5% of the total. Alberta's production advanced 38.6% during the year. Sales in Manitoba increased 25.7% and in British Columbia 28%.

The average selling price per barrel f.o.b. plant, in each province, was as follows: Quebec, $1.28; Ontario, $1.41; Manitoba, $2.43; Alberta, $2.08, and British Columbia, $2.23.

Imports of portland cement into Canada during 1928 totalled 34,047 bbl., averaging $4.29 per bbl.; in 1927 the average value was $4.52 per bbl. Portland cement exports were recorded at 267,325 bbl., valued at $340,624. The supply of cement made available for consumption in Canada in 1928 was the greatest on record and amounted to 10,790,650 bbl.

Capital employed by the five firms operating in the cement industry in Canada in 1928 was $47,678,841. Employment was furnished 122 salaried employes and 2,285 wage-earners; their combined earnings totalled $3,405,385. Fuel and electricity costs amounted to $3,872,108, of which $1,535,011 was expended for 297,079 tons of Canadian coal; $1,551,324 for imported coal; $783,129 for electric power; and minor sums for coke, gasoline and kerosene. Plant equipment included 1,282 electric motors with a total rating of 75,408 hp. Sixty-nine rotary kilns were in operation during the year.

Burning Rate of Black Powder

A REPORT of an investigation concerned with the effect of grain size, initial pressure, and means of ignition on the rate of burning or rate of pressure development of black blasting powder as compared with pellet powder, has been released by the Bureau of Mines as Serial No. 2940. The investigators found that there was no marked difference in the average rate of pressure development between the sample of pellet powder and the sample of 3F black blasting powder when the ignition was started with an electric squib; but when a No. 7 electric detonator was used the rate of pressure development was more than twice as great for the pellet powder as for the 3F black blasting powder.

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1928 AND 1929

Month	1928—Exports—1929 Barrels	Value	Barrels	Value	1928—Imports—1929 Barrels	Value	Barrels	Value
January	56,400	$204,875	78,639	$283,002	236,771	$315,797	151,302	$177,976
February	62,828	221,620	58,886	225,590	164,408	217,525	118,930	123,123
March	74,983	265,719	69,079	235,164	235,930	330,074	131,909	112,788
April	61,676	205,882	64,145	218,316	249,458	324,371	89,668	114,281
May	70,173	236,005	57,955	219,366	190,509	256,872	200,646	267,854
June	59,536	201,313	96,055	287,612	266,537	359,637	203,545	228,170
July	83,759	291,055	71,992	247,177	112,887	151,877	182,098	199,960
August	88,736	302,866	60,013	225,762	259,975	358,471	183,938	199,403
September	71,995	252,843	86,268	308,631	173,439	226,295	112,372	152,239
October	62,137	246,010	101,359	337,839	152,210	226,909	172,566	187,504
November	69,313	260,310	.....	.....	65,969	89,732	.....	.....
December	63,120	250,204	.....	.....	175,992	233,300	.....	.....
	824,656	$2,938,702	.....	.....	2,284,085	$3,090,860	.....	.....

Huge Beryl Crystals at Albany, Maine*

By E. K. Gedney and Harry Berman
Cambridge, Mass.

ALMOST remarkable occurrence of beryl has recently been discovered in the Bumpus feldspar quarry on the Cummings' farm in the town of Albany, about six miles south of Bethel. The huge crystals are noteworthy, not only for their size and quality, but also as a concentration of beryllium in such comparatively large quantities.

The beryl occurs in great, six-sided, log-like crystals embedded in the quarry wall, and is the outstanding mineralogical feature of the deposit. It is associated with much potash-feldspar for which the quarry is now being worked. A few plates of white mica are found coating the other minerals, and one or two masses of a beautiful rose quartz 6 or 8 ft. across are found associated with the feldspar and beryl.

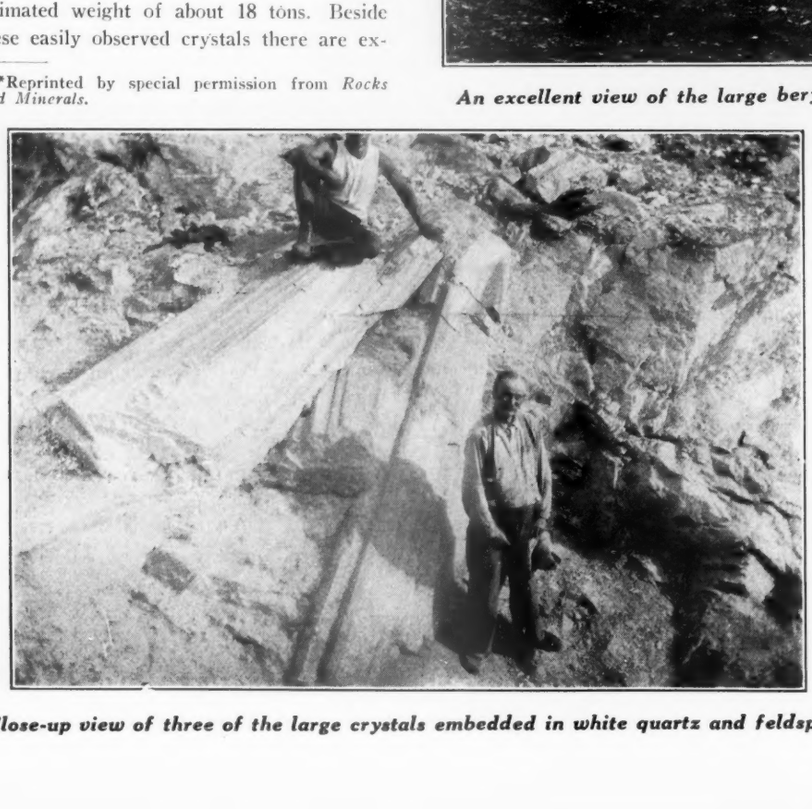
Crystals of Enormous Size

The enormous size of the beryl crystals are indicated in the accompanying photographs, one of which was submitted by Stanley Perham of West Paris, Maine, to whom the mineral rights of the quarry belong. The photographs are of the southwest quarry wall where the crystals were in greater abundance and best visible. Three crystals are well exposed by the mining operations and are each about 17 ft. long and a yard or more in thickness. The largest has a length of about 18 ft., a diameter of 4 ft. and an estimated weight of about 18 tons. Beside these easily observed crystals there are exposed portions of seven others which give indications of being fully as large.

One of the more prominent of these has a diameter of 14 ft. and is exposed for a length of 14 ft., although neither extremity of the crystal has as yet been uncovered. Another of equal thickness has been exposed for a distance of eight or nine feet without reaching either end. Others have been truncated by the mining operations and are only exposed in roughly hexagonal cross-sections which are all from three to four feet in diameter. In addition to the 10 large crystals, many smaller ones ranging from six inches to a foot or two in thickness are noted in the feldspar and quartz. They are not always in distinct crystals but intergrowths in compact groups with a rather irregular outline in section. One such group lying between a very large crystal of feldspar and a smaller mass of quartz was roughly oval in shape with a long diameter of about 8 ft. and a width of over a yard.

The larger crystals appear to be in groups radiating outward from a common center very much like the huge spoudmene crystals of the Black Hills of South Dakota. This indicates that the crystallization of the beryl began at one or more centers and proceeded outward from these centers in all directions forming star-like groups. The attitude of the crystals in the quarry wall seems to indicate that there are at least two, and perhaps three, of these radial groups partially disclosed.

An excellent view of the large beryl crystals exposed in the Bumpus quarry



Close-up view of three of the large crystals embedded in white quartz and feldspar

Close Grouping of Crystals

The crystals of beryl are closely grouped in the area exposed. No two so far observed are inclined at the same angle and they often lie one across the other with much the same appearance and attitude in the quarry wall as the logs in a log-jam in one of our northwestern rivers. They seem to be more or less localized in their occurrence and all of those so far noted could be enclosed within a circle of a radius of thirty feet of less. The beryl manifests little or no preference in its mineral associates. It is found with either quartz or feldspar, and in places a single crystal may cut directly across both of these minerals. Some of the larger crystals are somewhat cracked and fractured, and plates of mica up to an inch across are formed along these fractures.

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In general the beryl is a light apple-green in color, and more or less milky to opaque. It occasionally varies to an aquamarine variety which, however, is quite commonly badly fractured. Several attractive specimens of aquamarine, and a few broken fragments three or four inches across of golden beryl were noted on the dumps at the quarry.

The largest beryl crystal uncovered with a smaller one exposed at each end

There was estimated to be about eight or nine tons of broken beryl, and a ton or two of very attractive rose quartz on the dumps at and near the mine.

About 100 Tons of Beryl Exposed

The exposed portions of the crystals were measured with a view of estimating the amount of beryl observed on the surface in the quarry and on the dumps. About a hundred tons were found exposed to view, and the evident similarity of size between the partly exposed crystals and those large ones more fully revealed, together with their general radial grouping indicating many still uncovered crystals, suggests that at least an equal amount may yet be revealed by future mining operations.

Beryl contains about 67% of silica, 19% of aluminum oxide, and 14% of beryllium oxide. Hence a hundred tons of beryl will contain about fourteen tons of beryllium oxide or approximately five tons of the metallic element beryllium. Inasmuch as the beryllium content of the average granite rock is so small that it does not appear in a chemical analysis, the deposit at Albany represents an enormous concentration of the metal, and is the largest single deposit as yet found in this country.

Other large crystals of beryl have been noted in the United States, particularly at the Ruggles mine near Grafton, N. H., in the Black Hills of South Dakota, and at Royalston, Mass., but the Albany deposit is probably entitled to rank first as a beryl locality because of the size and number of its crystals.

Large Beryl Strata Uncovered in Maine Attracts Attention

THE large beryl crystals found at Albany, Me., have attracted the attention of the scientific world. They are claimed to be among the largest ever found and a movement is on foot to purchase them from the quarry owners for museum purposes. Professor W. B. Scott, geologist of Princeton College, New Jersey, in an address to the National Academy of Scientists, said:

"Nothing like this has ever been found before in the entire world. Nothing like them, in fact, has ever been dreamed of before, and it would be a terrible shame to destroy them. They are worth $800 each as raw material, as they stand. The quarry company cannot afford to pass up their use.

"I recommend that the Academy ask the Conservation Commission of the State of Maine to take care of them. They should lie where they were uncovered. This will necessitate a shelter for warmth, otherwise frosts will disintegrate them.

It has been suggested that the state of Maine purchase these crystals and charge a small fee to interested observers, the fee to go towards the cost of their preservation.—*Norway* (Maine) *Advocate.*

[Editor's Note: These crystals are described in an article which appears in this issue of Rock Products.]

Quarry Lands at Delphos, Ohio, Purchased for Development

AUSTIN A. Miller of Toledo, reporting to be acting for the France Stone Co., has purchased 60 acres of quarry land west of Delphos, Ohio, according to the *Delphos* (Ohio) *Record.* Part of the purchase, a tract of almost 40 acres, was bought for a reported price of $8600. The other parcel is said to have brought $10,000.

Some time ago the Delphos properties of the American Stone Corp., known as the Limestone Quarries, were sold to interests said to be the France Stone Co. also. This report was never confirmed, however. Whether the land purchases which adjoin the American properties will eventually provide for expansion of the present quarry or will mean the opening of a new quarry at Delphos cannot yet be determined.

Sparta Granite Quarry to Be Reopened

PLANS are being made to open one of the large granite quarries located near Sparta, Ga., so that the plant, which has been shut down for some months, will be in full operation by the first of the new year. It is said that several large contracts have been secured by the granite contractors, which will give work to numbers of skilled stone cutters for many months. Since the collapse of the Florida boom, which put many of the quarries to work here, the stone business has been almost at a standstill. Much granite curbing was shipped to Florida from here, as well as crushed stone for paving.—*Macon* (Ga.) *Telegraph.*

Selling Phosphate Fertilizer Through Radio Talks

THAT the rock product industries are not slow to take advantage of modern methods of advertising is evidenced by four radio messages by Ray P. Hoover, vice-president of the Ruhm Phosphate Co., Mt. Pleasant, Tenn., broadcast recently over WENR, "Farmer Rusk's Station," Chicago, Ill.

Mr. Hoover, addressing the farmers of the nation, gave interesting and valuable information as to the use of lime phosphate for soil fertilization as well as a brief description of the occurrence and method of recovering Tennessee phosphates.

There can be no question but that Mr. Hoover's talk reached a large number of the farmers who certainly should be interested in a preparation of such facts as were given.

Beg Your Pardon!

Editor, Rock Products:

We note in your November 23 issue the article entitled "New Feldspar Grinding Mill," by H. J. Bryson. This article begins with the statement: "The new feldspar grinding plant of the Feldspar Milling Co., Burnsville, N. C., which began operations about May 15, 1929, was the first electrically operated feldspar mill ever designed."

We wish to correct this statement, as our plant, since its very inception in 1924, has always been and still is operated entirely by electric power. The quarry is also completely electrically operated, and no other form of power is used at this quarry or mill.

UNITED STATES FELDSPAR CORP.,
J. H. Weis, Manager.
Cranberry Creek, N. Y.

Foreign Abstracts and Patent Review

Thermal Balance in Cement Kilns. Sozzetti calculates, from two examples, the heat volume required in burning cement, and the heat wasted in the burning process. The vertical kiln has a total loss of about 30%, most of which is lost in the waste gases and by the perviousness of the kiln wall. The rather considerable loss by radiation may be obviated nearly wholly, if not entirely, by suitable design of the kiln.

In the rotary kiln, which has a loss of nearly 45%, the principal heat loss is caused by the evaporating of the water in the wet charge. Considerable progress has been made recently in the endeavors to utilize the heat of the waste gas in such plants.—*Industrie del Cemento* (1929), **26**, 2.

Cement Kiln Refractory Linings. K. Endell reports on the heat expansion and the sensitivity to temperature of refractories used in wet process rotary cement kilns. He describes the Steger heat expansion recorder for temperatures to 1652 deg. F. and a new "comparative apparatus" for the same purpose for temperatures up to 2912 deg. F. The expansion curves of the following refractories are given in Fig. 1 as follows: No. 1, acid chamotte stone, about 72% SiO_2, 21% Al_2O_3; No. 2 basic chamotte brick, about 52% SiO_2, 44% Al_2O_3; No. 3 high-alumina chamotte brick, 27% SiO_2, 69% Al_2O_3 (sillimanite); No. 4, silica brick, well burned, specific gravity, 2.35, 94% SiO_2; No. 5, silica brick, poorly burned, specific gravity, 2.50, 94% SiO_2; No. 6, magnesite brick, about 88% MgO; No. 7, cement clinker brick, about 65% CaO.

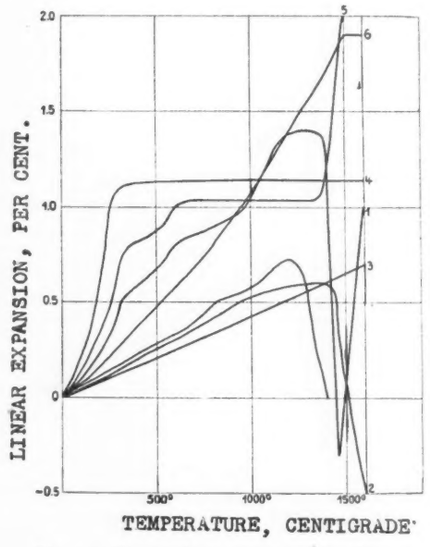


Fig. 1. Expansion curves of various cement kiln refractories

The author describes also an electrically operated device and its use for determining the resistibility of refractories to sudden temperature changes. The results of tests with this apparatus are summarized in the following, and which give the number of "freezings" resisted by refractories at 1562 deg. F. and dipped into cold water: silica brick and magnesite brick burst after one to two "freezings;" acid chamotte brick withstood 3 to 5; basic chamotte brick, 5 to 30 and frequently more than 10 "freezings"; sillimanite stone, 10 "freezings"; and cement clinker brick because of the removal of the "water" from the portland cement used in setting, crumbles after 1 to 2 "freezings," without, however, bursting.—*Zement* (1929), **18**, 38.

Automatic Lime Kiln. A new automatically operated lime kiln and complete quarrying and handling equipment has been built for the Mannesmannroehren-Werke of Duesseldorf in the Neanderthal Valley, Germany. This valley, already well known because of the finding of the skeleton of the Neanderthal man, has large resources of high calcium limestone. The new plant has a production capacity of 350 tons of burned lime and 200 tons of crushed stone per day, all of which is consumed by the company's steel works and smelting works.

The raw material, hauled by dump wagons from the quarry to bins, is passed to jaw crushers which reduce it either to kiln size or to crushed stone. The sized material passes by way of an inclined conveyor and a hopper into the individual rock bins. From here it is drawn to dump-wagons and carried direct to the lime plant, where the wagons dump into the charging bins located in front of the kilns. The stone is delivered from the bins to the top of the kilns by a bucket elevator.

The lime plant comprises one shaft kiln of 60 to 70 tons capacity and three shaft kilns each of 100 tons capacity of burned lime per day. The three large kilns are one unit and the smaller kiln stands is a separate unit.

The charging and discharging equipment designed by Eckardt and Hotop renders the operation of the kilns entirely automatic. Only one man is required to check the operation, lubricate bearings and to start and stop the electric motors.

The charging equipment consists of an iron hopper which is closed off by means of a weight-balanced bell. This bell opens automatically and only after the previously determined quantity of limestone and fuel has been loaded into the hopper and then drops this charge into the kiln. After the load is discharged the bell closes the discharge of the hopper again. Movable iron plates located centrally below the throat protect the kiln lining against the hard limestone and force the impinging large pieces of rock to drop in the middle of the shaft cross section. The rock is quite well distributed over the entire cross section of the kiln.

The kiln shafts have a burning depth of 62 ft. They are closed at the base by a saddle construction combined with a mechanical stoking apparatus. The discharge equipment is operated by Bergmann's automatic control.

The burned lime drops from the grate to classifying screens which separate lump lime and lime fines, the screens discharging to bins underneath which are loading tracks.

The structure for the three large shaft kilns is open at the side and provides six observation platforms. Movement of material at the plant is in one direction, so that there is no criss-crossing, etc. Few men are required to operate, each kiln requiring but one man to deliver the limestone to the bucket conveyor. In addition to these four there is a general attendant for the entire plant and the superintendent. The four kilns of the Neanderthal lime plant produce all told 350 tons of burned lime per day at a fuel ratio of 16 to 17% and with only the labor of six men. The plant has been operating satisfactorily and safely. Eckardt and Hotop of Koeln were the builders.—*Tonindustrie-Zeitung* (1929), **53**, 73.

Characteristics and Testing of Lime and Cement Colors. Dr. C. R. Platzmann describes various colors and their application for coloring construction work made with lime and cement.—*Baumarkt* (1928), 30.

Tricalciumsilicate Investigation. E. Jaenecke shows that the x-rayogram of "tricalciumsilicate" as determined by Hansen and Brownmiller contains the diagrams of CaO and β $2CaO{\cdot}SiO_2$. Their work proved also, as in many other investigations, that tricalciumsilicate consists of CaO and β $2CaO{\cdot}SiO_2$. The investigations of Guttmann and Gille represented, unintentionally, a contribution to the correct conception of alit as being a mixed crystal of $2CaO{\cdot}SiO_2$ and $8CaO{\cdot}Al_2O_3{\cdot}2SiO_2$. Jaenecke draws these conclusions from a comparative table giving the x-rayogram of Jaenecke and Brill, and the "tricalciumsilicate" of Hansen and Brownmiller from a table by Guttmann and Gille.

Guttmann and Gille in answer to Jaenecke show that their optical and chemical determinations make the conformity of the alit with the tricalciumsilicate certain. The free lime, especially, is no necessary constituent of the clinker or even of the alit. The conclusions made by Jaenecke in regard to the

constitution of tricalciumsilicate and alit do not withstand a closer re-examination and do not break down the findings of Guttmann and Gille (*Zement*, 1929, **18**, 30).—*Zement* (1929), **18**, 46.

"Best" Raw Mix for Cements. Calculation of the "best" raw mix for cement is, according to H. Kuehl, obtained by the formula:

$$X = -\frac{2.8\,SiO_2 + 1{\cdot}1Al_2O_3 + 0.7(F_2O_3 + Mn_2O_3) - CaO}{2.8\,SiO_2 + 1{\cdot}1Al_2O_3 + 0.7(F_2O_3 + Mn_2O_3) - CaO}$$

Where X = quantity of limestone in lb. to be mixed with 1 lb. of clay.

In the above equation the analysis figures for clay are entered in the numerator and those for limestone in the denominator. This formula has been in successful use for some time by the author (H. Kuehl).

For the "best" lime contents, the following formulas are proposed:

$$CaO = 1.86 + 2.2\,Al_2O_3 + 0.7\,Fe_2O_3 + 5$$
(Jaenecke)

$$CaO = 2.80\,SiO_2 + 1{\cdot}1Al_2O_3 + 0.7\,Fe_2O_3$$
(Gultman and Gille, also Kuehl)

$$CaO = 2.8\,SiO_2 + 1.65\,Al_2O_3 + 0.35\,Fe_2O_3$$
(Gultman and Gille)

High accuracies are ascribed to the above. *Zement* (1929), **18**, 27.

Pumice Admixtures for Cement and Lime Products. W. Serkin describes the chemical and physical properties, deposits and use of the Rhineland pumice sand. In the hand-manufacture of lime products the pumice sand is crushed, a lime putty made from dolomitic lime poured over it and a good mix given the mass. The mix is rammed by flat hammers into iron forms, then removed on a baseboard from the form and allowed to dry for 3 to 4 months. In the recent manufacture by machine, portland cement or other binder is added in 1:8 proportions to the pumice sand. Increased strengths for the various porous products made with pumice sand are said to result.—*Tonindustrie-Zeitung* (1929), **53**, 85 and 87.

Effect of Grinding Mill Temperature on the Set of Cement. It is generally conceded that the "flash" or early set of cement, which has been observed in using very finely pulverized cements, is not harmful to the cement and does not affect the cement strengths. These cements always contain sufficient additive gypsum or other agent for controlling or retarding the starting of the set.

The author experienced the flash set occasionally, even when the SO_3 content corresponded to the correct addition of gypsum to the portland cement, provided the mortar was mixed for the customary period of about two minutes. These flash set cements could not be proven to be early strength cements. If the time allowed for mixing was extended beyond the two minutes the flash set phenomena disappeared gradually until normal set returned, as shown below for differently ground cements from the same clinker:

Fineness, retained on 178-mesh sieve	Start of set after— 2-min. mix.	15-min. mix
6%	3 min.	95 min.
4%	2 min.	90 min.
2%	6 min.	112 min.
0.9%	2 min.	100 min.

The flash set occurs not only in very fine cements but also in coarsely pulverized cements, so that too fine grinding cannot be the cause. This flash-set cement worked easily and showed practically no difference in the strengths. The small test mill did not produce a flash-set cement, but only the large mills.

The mill temperatures were observed for about 8 months and the results compared with the start of set of cement specimens from the mill. These temperatures differed greatly according to season of the year, hardness of the clinker, period of storage, etc. With an increase in temperature the period to the start of the set was shortened, and the flash-set cement was producted at a mill temperature of 230 deg. F. or above.

Investigations were made to determine whether the cement clinker had been changed by the temperature or whether the gypsum suffered in dehydration. Gypsum is known to lose crystal water during pulverizing, and it is quite possible that the high temperature of the mill together with the mechanical influence of pulverizing dehydrates the gypsum to an extent where it is unable to retard the start of set. Probably the gypsum is changed to anhydrite, which is then, with water of the mix, reconverted into semi- and double hydrate. This would explain why during an extended mixing the flash-set cement becomes again a normal-set cement, and why when mixing for about two minutes the resulting early start-of-set is followed by a normal setting period.

The flash-set phenomena was observed originally only in very finely ground cement because a finer grinding implies more work and hence a higher temperature in the cement mill, and because gypsum loses more crystal water as pulverizing continues.—*Zement* (1929), **18**, 46.

Alumina Cement. This process employs bauxite-limestone or bauxite-lime mixtures which are leaner in lime (CaO) than the mixtures employed thus far in the making of alumina cements. The mixtures are so proportioned that the lime (CaO) content of the ultimate product is at the most equal to one-half the sum of its content of silica and alumina. There is a much greater difference between the fusion point and the softening point of these mixtures than in those employed thus far. The new mixture may be clinkered at 2192 to 2732 deg. F. without danger of portional fusions. Whereas the average percent. composition of alumina cement used thus far is 10 SiO_2, 40 Al_2O_3, 10 Fe_2O_3 and 40 CaO the composition of a cement clinkered according to this patent is 5 SiO_2, 55 Al_2O_3, 15 Fe_2O_3 and 25 CaO. This composition corresponds to a raw mix of 75% bauxite and 25% high calcium slaked lime at equal volume.—*U. B. Voisin, German Patent No.* 482,185.

Action of Magnesium Sulphate on Cement. P. Kremser describes the occurrence of magnesium sulphate and its chemical relation to cement. Lime, the principal constituent of cement, is subject to the disintegrating action of magnesium sulphate. The reaction occurs chiefly according to the equation: $Ca(OH)_2 + MgSO_4 = CaSO_4 + Mg(OH)_2$; the hydrate of magnesia being a white, copious gelatinous mass. The $CaSO_4$, as formed, combines with tricalcium aluminate ($3CaO{\cdot}Al_2O_3{\cdot}12H_2O$) contained in the cement and absorbs 30 molecules of water of crystallization to give origin to the detrimental compound, sulpho-aluminate of calcium, $3CaO \cdot Al_2O_3 \cdot 3CaSO_4 \cdot 30H_2O$. This action effects change of volume and disintegration of the cement. The author then describes the results obtained in saturating the specimens with "Sika," a cement paint for reducing disintegration by magnesium sulphate.—*Industrie del Cemento* (1929), **26**, 8.

Fused Portland Cement from Blast Furnace Slag and Limestone. This process for producing portland cement employs comparatively easily fusible substances as dissolving agents for the components which enter into reaction. For example, with a fusion mass, which may be prepared in a kiln at 1400 C. (2552 deg. F.) of 120 parts limestone, 10 parts calcium chloride and 20 parts fluorspar (all by weight), there can be mixed 100 parts of fusible blast furnace slag directly under conditions which assure a complete homogenization. This eliminates the otherwise necessary preparation of the raw materials; the heat content of the fluid slag is utilized better and the production temperature is comparatively low. The cement produced by grinding 20 parts of this fused cement clinker, 78 parts granulated blast furnace slag and 2 parts raw gypsum showed in standard testing a normal set, volume consistency and mortar strengths which were about 60% above the minimum strengths required for portland cement.—*Otto Keune, German Patent No.* 482,327.

Gypsum Molding Plasters. A study of the gypsum plasters shows that the good molding plaster is a semi-hydrate, contains no unburned, overburned or foreign matter and is uniform. Between plasters there is only the difference in fineness of grinding. There is but one quality of molding plaster; it is mixed with about 65% water, has a working period of 10 to 15 minutes and reaches a strength of 284 to 313 lb./in.^{2} in dry specimen bricks. The properties desired in the molding plaster by the various trades include primarily a high strength, sufficient porosity and a good yield.

When less water is used in the mix the strength increases, but the porosity and yield decreases, and vice versa when more water

is used. For a plaster of higher strength a smaller quantity of water has to be used. A plaster has been developed which requires normally only 45% of water of its weight and gives a tensile strength double that of ordinary molding plasters. In certain special cases only 35% of water need be used, which gives a paste of the consistency of glazier's putty; this is then pressed into the mold; its tensile strength is 2½ times that of ordinary plasters. The yield and porosity factor decreases thereby considerably, the mass becoming very dense so that it is well protected against the solvent action of water. Mixed with 45% of water, the plaster is suitable for all work requiring a high strength and where yield and porosity are less important, as in foundry work. But when mixed with 65% water this plaster gives strength, yield and porosity as ordinary molding plaster.—*Revue des Materiaux de Construction et de Travaux Publics* (1929), 238, pp. 262-263.

Packaging Cement. Goslich, supplementing the statements of Dr. Luftschitz (*Tonindustrie-Zeitung*, 1929, **53**, 84) does not consider the paper bag responsible for causing reversion of set in some cements. He believes that the phenomena occurs also when other kinds of packages are used. He is not in agreement with Luftschitz on the matter.—*Tonindustrie-Zeitung* (1929), **53**, 87.

New Japanese Cement Specifications. Japanese portland cement specifications for 1929, as revised from the 1927 specifications, provide for the following strengths:

Storage in water, days	3	7	28
Tensile strength, kg. per sq. cm.²	15	20	25
Compressive strength per sq. cm.²	150	200	300

Residue on the 4900-mesh (metric) screen with wire of 0.55 mm. should not exceed 12%; minimum specific gravity, 3.05; maximum SO_3 content, 2%; maximum MgO content, 3%; maximum loss on ignition, 4%; maximum addition of foreign substances, 3%; initial set, not less than 1 hr. nor more than 10 hr.—*Zement* (1929), **18**, 42.

Deterioration of Cement-Kiln Linings. Mueller states that analysis of raw slurry and of the clinker produced from it showed regularly an increase of 15.8% of Al_2O_3 and of 9.3% of Fe_2O_3. The decrease in durability of the kiln lining coincided with a slight addition of fluorspar in the cement slurry. The alumina content in the "chamotte" stone decreased considerably, and an increase of fluorine and alkalies at the places where matter deposited on the lining at the point of contact of the lining and deposit, especially back of the sintering zone was observed. The deposit analyzed 0.73% CaF_2 and 1.13% $Na_2O + K_2O$; that at the point of contact of slurry feed contained 1.16% CaF_2 and 12.76% alkalies. The poor durability of the lining was attributed to a decrease in alumina in the lining and increase in alkalies.

The detrimental alkalies, it was found, enter the kiln lining under influence of fluorspar and the sesqui-oxides travel from the chamotte into the clinker. Sodium fluoride and calcium fluoride fuse below 1000 deg. C. and boil above 1500 deg. C., whereas aluminum fluoride and ferric fluoride have boiling points below 1000 deg. C. Accordingly, sodium fluoride and calcium fluoride form in the sintering zone, fuse and then enter the kiln lining. The fluorine in the lining enters in new combinations with Al and Fe; these new compounds are volatile at the cement burning temperature and deposit in part on the colder raw material at the charging side of the kiln. When this raw material enters in the sintering zone the fluorine serves again as a transporting agent for the alkalies.

Grimm stated in the discussion of the subject that he observed similar increases in the clinker with alumina also without fluorspar, and also in a lining of cement stone, hence he assumes that alumina originates from the coal ashes.—*Tonindustrie-Zeitung* (1929), **53**, 83, and *Zement* (1929), **18**, 43.

Crystallization Forces in Cement. Curt Pruessing presents test data on the crystallization forces set up in the hardening of portland cement. The so-called K1 storage of Gensbaur shows that the standard tensile strengths of cement mortar specimens obtained in combined storage decrease when the specimens are placed for 28 days (K1 storage) in water. Gensbaur maintains that the decrease in strength is a dependable guide for measuring the volume consistency of cement. However, Pruessing gives data which contradicts the view of Gensbaur.

According to Pruessing, volume consistency is affected only by two factors, a natural swelling and shrinkage caused by the physical condition, and, second, blowing caused by chemical non-equilibrium of the cement; that is, faulty manufacture. The phenomena observed in the K1 storage is only a natural disturbance due to change of physical condition of the mortar specimens and is not a measure for the unnatural disturbance in volume consistency.

The hardening process of cement is considered as a disintegrating process in which the large molecular compounds of the clinker are split up into compounds of simpler structure while water is being fixed. There are many intermediate members in the series of disintegrations which ultimately work towards a simple lime salt, alumina silicate and water-bearing silicic acid as the principal final products. The final products of the disintegrations are not attained in any cement under natural storage conditions. The chemical condition of the individual specimens is dependent on the age of the specimen and the nature of storage.

Regarding formation of the lime salts, the reaction equilibrium between caustic lime and carbonate of lime leans towards the caustic lime during storage in water and towards carbonate of lime during storage in air. Naturally this forces a displacement in the reaction equilibrium of the other constituents.

The hardening process approaches different states of equilibrium in different storages and each change in storage effects a disturbance in the state of equilibrium, which must lead to tensions in the specimen. This latter influences the results in strengths, particularly when the test is made while the specimen has not yet revived from the effect of change in storage and has not yet reached the reaction equilibrium belonging to the new storage condition.

Pruessing proved his contentions by testing various cement specimens, some of which were 9, 13 and 23 years old. According to the theory of K1 storage, the fluctuations in strength should decrease as the specimens become older; but Pruessing found the fluctuations practically equally extensive in specimens of any age and any mixing proportion. For further data, the details concerning the tests should be read.—*Zement* (1929), **18**, 41.

Chemical Constitution of Cements. Ferrari reviews the literature dealing with the chemical constitution of calcareous cements. He cites 68 references dating between 1785 and 1925.—*Industrie del Cemento* (1928), **25**, 6.

Calcium Sulphate and Cement. The author discusses the addition of calcium sulphate and its various modifications to portland cement. He presents the test data as given by Professor Budnikoff in Stroitelnaja Promyschlennost (1926), 2, 102.—*Industrie del Cemento* (1929), **26**, 4.

Water Requirement of Cement Mortar. H. Kuehl explains the significance of the fineness of cement and of the chemical composition of cement upon the water requirement of the cement mortar. The water requirement of 24 cements tested increased with the increase in fineness; the greatest tensile strength was obtained with cement of average fineness. As more water is added the maximum strength shifts towards the coarser cement. Due to variation in the additive water there were differences in strength as great as 50%; these differences were smallest for the average degrees of fineness and greatest for the very finely pulverized cement. — *Tonindustrie - Zeitung* (1929), **53**, 85, **86**, *Zement* (1929), **18**, 45.

Slag Cements. Sevieri reviews the nomenclature and history of artificial iron portland cement, portland-type blast furnace cement and the blast furnace slag cement, referring to the literature of various countries.—*Industrie del Cemento* (1929), **26**, 4.

Report of the German Materials Testing Bureau. Special Issue VII, (1929, Berlin, Jul. Springer) is devoted to recent developments in the field of cement research. Two chapters deal with alumina and blast furnace cement and other chapters deal with portland cement, particularly the influence of

additions upon the setting and hardening properties—*Tonindustrie-Zeitung* (1929), **53**, 88.

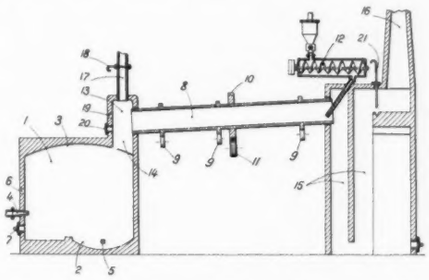
What Is a "Special Cement"? Dr. Fuld, counsellor of justice, discusses from the legal standpoint the definition of a special cement as applied to a special portland cement and to natural cements.—*Zement* (1929), **18**, 26.

Cement Research in Germany. Special Publication No. 7 concerning reports from the Government Material Testing Bureau at Berlin-Dahlem is reviewed briefly. The articles were prepared during the last few years and most of them have already appeared in German technical papers.—*Zement* (1929), **18**, 38.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Government Printing Office, Washington, for each patent desired.

Fused Cement. Cement, particularly fused cement, is made in a process involving a combination of rotary kiln and reverberatory furnace. The furnace is provided with a hearth and tuyere arrangement to inject fuel horizontally on to the hearth;



Combination open-hearth furnace and rotary kiln for production of fused cement

the rotary kiln, or preheating kiln is adapted to receive the hot gases from the furnace, having its lower end directly above the furnace hearth. A kiln head in the upper portion of the hearth connects directly with the lower end of the kiln. The preheated cement mixture (below clinkering point) is discharged from the rotary kiln in such a manner that it falls vertically into the furnace and upon the hearth; it is spread and fully exposed to the impinging action of the flames.—*George Dumas (assignor to Societe Anonyme des Chaux et Ciments de Lafarge et du Teil. Ardeche, France)*, U. S. No. 1,728,597.

Portland Cement. The raw cement materials are burned in the usual manner in a rotary kiln. To the fuel (coal, etc.) is added lime in slaked or quick form, in sufficient quantities to convert the fuel ashes to a cement mixture. The lime is mixed with the coal if desired and ground to the same fineness as the latter. Limestone may be substituted for lime in the process.

The inventor claims elimination of kiln rings and unusually sound clinker to result from his process.—*J. J. Hendrickx (assignor to Societe Anonyme Etablissements, Poliet and Chausson, Paris, France)*, U. S. No. 1,728,828.

Grinding Finished Cement. In order that the temperature of the material in the finished grinding mill shall not be raised during grinding to the point where the raw gypsum is converted to plaster of paris, the inventor uses a cooler inserted between two grinding mills. This cooler, illustrated herewith, is a tubular cooler in which the cement moves upward through tubes d' in a

Cooler inserted between two cement grinding mills

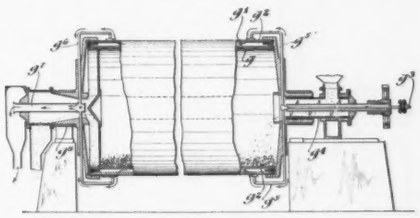
shell c which is supplied with cooling water admitted at c' and discharged at c^2. Below the lower tube sheet d^2 is a chamber f, in which is placed a mechanical mixer f' and to which is supplied air, as indicated at f^2, f', whereby the cement material is reduced to a condition of fluidity and, being constantly supplied by the conveyor f, is made to flow upward through the tubes d' of the cooler d. From the upper tube sheet d^3 the cement material flows out through a chute or conduit d^4 directly into the second mill c.

In the passage of the material through the cooler d, the temperature of the material is reduced to such a degree that the heat added to the material by the grinding to a special cement fineness in the mill c will not raise the temperature of the material above the critical temperature at which the conversion of raw gypsum into plaster of paris would take place.—*P. T. Lindhard (assignor to F. L. Smidth and Co., New York)*, U. S. No. 1,728,496.

Rotary Kiln Feed Control System. An electric control system by which feed to the kiln is automatically fixed by the revolutions of the kiln. The rate of feed can be automatically and intermittently interrupted in accordance with variations in the speed of the kiln, without any variation in the running speed of the prime mover during the feed.—*W. R. Bendy*, U. S. No. 1,731,809.

Improved Process for Manufacturing Cement from Slag. Molten slag from the blast furnace is poured to a second furnace at which is added sufficient lime or limestone to form a bicalcic silicate. This product is allowed to cool and on so doing disintegrates spontaneously. The disintegrated mass, without grinding, is added to pulverized limestone, wetted and ground to desired fineness and then burned in the usual wet process cement manufacture methods.—*J. G. Bergquist*, U. S. No. 1,731,189.

Cement Grinding Mill. The grinding mill is provided with a water jacket through which a continuous flow of cold water flows during the process of grinding. The cooling water absorbs heat from the mill, grinding bodies and materials therein, thereby

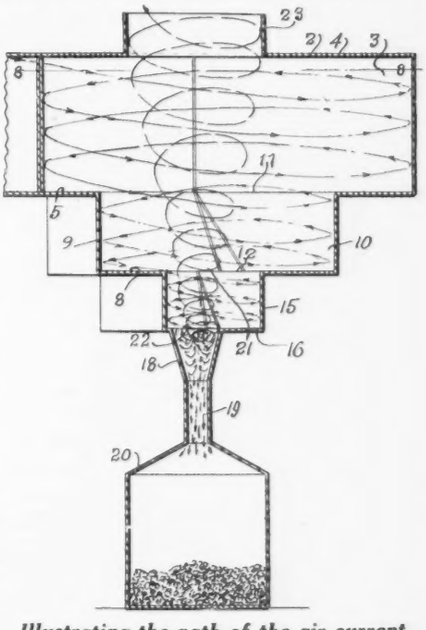


Cement grinding mill with a water jacket for cooling material within

preventing the conversion of the raw gypsum additive to plaster of paris.—*P. T. Lindhard (assignor to F. L. Smidth and Co.)*, U. S. No. 1,728,495.

Dust Collection. A new dust collector embodies the same principles that are used in a cyclone but in a different form of collector. Instead of a cone a series of cylinders decreasing in size is used. The bottom terminates in a sealed chamber which holds the collected dust.

The inventor claims that this form reduces the effect of cross currents and internal turbulence and requires less power to produce the cyclonic action. Another effect is to create a partial vacuum in the chamber which encourages the fall of the dust. This is one of the effects of the rise of the stream of air through the center of the apparatus.



Illustrating the path of the air current in a new dust collector

The path of the current is shown in the accompanying drawing.

Projecting lips prevent particles of dust from riding up the sides of the scroll sheets which make up the spiral chambers.—*H. W. Pfeffer*, U. S. No. 1,719,447.

U. S. Gypsum Purchases Niagara Gypsum Co.

ACCORDING to recent announcements, the Niagara Gypsum Co., the plant and manufactory of which is at Oakfield, near Batavia, N. Y., has been acquired by the United States Gypsum Co. The Niagara firm is regarded as one of the most prosperous in this district and is valued at approximately $500,000.

The Niagara plant now adjoins a unit of the U. S. Gypsum Co., and under the new ownership it is likely the two branches will work in close harmony. M. A. Reeb, president of the Niagara company, declined to give any details of the terms of sale other than to say it was in large part a stock proposition, and was in the nature of a merger.

The gypsum is mined at the site of the plant in Oakfield, the capacity being about 500 tons a day. The finished products also are produced here, among them wall board, cement plasters, wood fiber plaster, sanded plaster, gypsum lath and other gypsum products used in the building trades.

It is understood that the new unit is to be known as the Niagara and Peerless division of the U. S. Gypsum Co.

Hawkeye Cement to Expand Crushing Operations

PLANS for a large crusher to be installed and placed in operation at the quarry early next spring were announced by officials of the Hawkeye Cement Co. recently. The move is made necessary by the increased demand for limestone aggregate and cement due to Iowa's expanding road program. Work on the project has begun and will be completed as rapidly as possible so that everything will be in readiness to crush with the coming of warm weather. The entire output for 1930, 175,000 tons, or approximately 3500 carloads of limestone aggregate, has been contracted for by the Iowa State Highway Commission to be used in road construction.

The new crushing plant will be located in the east branch of the quarry which was opened for work only this spring and will be situated near the south end. A force of men has been at work leveling a roadbed for the necessary wide-gage tracks. When this detail has been completed and the foundation erected the crusher will be moved in and put in place. It will have a capacity of 2000 tons each 10-hour shift. The quarry personnel will be probably doubled. An additional locomotive will be required to handle the increased movement of cars and a double-track outlet to the "Y" is under consideration to provide faster movement of the loaded cars away from the Clucas junction.

The installation of the new crusher will give the quarry a projected output of 750,000 tons for the ensuing year 1930. Nearly half of this figure will be shipped to the Valley Junction plant where it will be made into cement. One hundred and twenty-five thousand tons will be sent to the plant in the same manner, there to be crushed into limestone aggregate and shipped out to various points in the middle west. The remained, as stated, includes the stone to be converted into road surfacing material here. This figure is more than double the rock quarried a few years ago at the quarry and indicates the impetus to the cement and crushed stone industry given by Iowa's program for better roads.

Installation of the crusher confirms a report of long standing. Why the Hawkeye company has not seen fit to get into the business of crushing rock on a large scale for commercial purposes has puzzled many for a long while. During the year past the plant at Valley Junction has been able to dispose of all the limestone aggregate it could crush for use on smaller surfacing projects. That the company is imminently in position to develop this business cannot be gainsaid. The quarry at Earlham is capable of vast expansion to meet the road building requirements. In connection with the cement industry the crushing of limestone aggregate fits remarkably well. This is because the finer shale, such as that found unsuited for use and discarded, is not at all unsuited for making cement. There is no waste in working the two lines together, and in addition the aggregate is found to be of better quality because it can be selected for the purpose intended. There is no objectionable high percentage of clay in the rock after it has been screened and the finer product of the crusher removed for the cement kilns.—*Earlham* (Iowa) *Echo.*

National Portland Opens White Cement Plant

THE announcement was made recently by the National Portland Cement Co. of the official opening of its plant at Chubbuck, Calif., the first factory for the manufacture of white cement in the western part of the United States.

The National company also has a plant at Houston, Texas, which will be in operation in about 30 days. This mill will be used to grind cement clinker shipped from the Chubbuck operation.

Approximately 600 El Paso stockholders are interested in this project. The company was partially financed through the Midwest Building and Investment Corp. of El Paso, Texas.

H. J. Harris of Dallas, Texas, is president; C. W. Boone of Tyler, Texas, is vice-president, and C. S. Atkinson of Houston, Texas, is secretary and treasurer of the National Portland Cement Co.—*El Paso* (Texas) *Times.*

Pioneer Company Acquires Building Materials Firm

THE PHYSICAL merger of the Pioneer Sand and Gravel Co. and the George Scofield Co., Seattle, Wash., will take place on January 10, 1930, when the latter concern occupies the new warehouse structure now building at 9111 Fairview avenue and establishes its offices with the Pioneer Sand and Gravel Co. at 9111 Harrison street. Announcement of the physical merger is, in effect, the first official announcement of the acquisition of the Scofield company by the Pioneer Sand and Gravel Co. The consolidation will result in creation of the George Scofield division of the Pioneer Sand and Gravel Co. O. E. Tisch is manager of the new division. The personnel and sales policy will remain the same, according to Manager Tisch, who stated:

"The amalgamation will react to the benefit of the building industry in that the company can afford contractors and builders more efficient service by reason of more complete stocks in all basic lines of building materials. All lines handled by the Pioneer Sand and Gravel Co. will be distributed by the George Scofield division in addition to the materials heretofore distributed. Service and delivery will be improved and in many other ways the merger will prove of advantage to local constructors."—*Seattle* (Wash.) *Journal of Commerce.*

American Aggregates Corp. Reports Good Business

OVER 11,300 cars of sand and gravel were shipped during 1929 from the Urbana, Ohio, plant of the American Aggregates Corp., according to E. D. Sexton, plant manager. This was the largest ever shipped in any one year from that plant. The Pennsylvania railroad was the biggest customer, now using washed gravel for ballast.

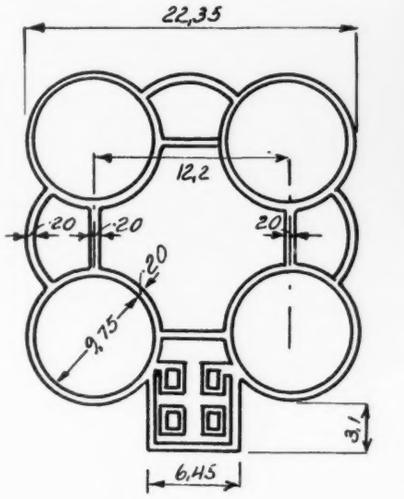
The two Indianapolis plants of the company have shipped approximately 500,000 tons of sand and gravel since May. The No. 1 plant, the larger of the two, will be enlarged by the installation of a 20-in. dredge pump and line, this winter, replacing the 15-in. pump now in use. With the installation of the new pump the capacity of the two plants will be approximately doubled.

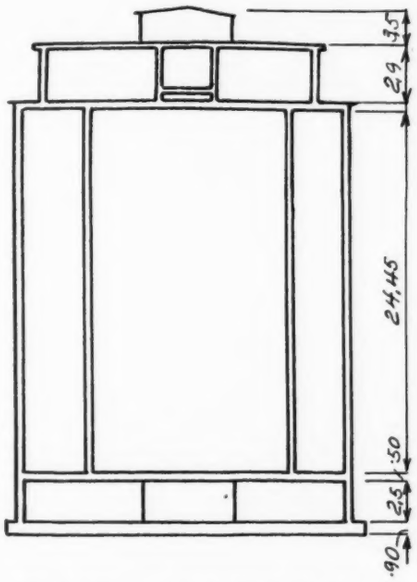
Along with the new pump, a desander will be installed on the dredge. It will take out excess sand and will allow the sand and gravel to run into the washing plant in a 2-to-1 ratio, favoring gravel, which is the average carload basis of the company sales. The excess sand will be used to fill in the "lake" for loading tracks.

The combined capacity of both plants with the new equipment will be around 6,000 tons a day. The company has a contract with the Indianapolis Belt Railway to provide 5,000,000 cu. yd. of the excess sand and top soil strippings for fill.—*Indianapolis News.*

South American Cement Plant Expands

THE illustrations shown here are of the new cement storage silos constructed in Montevideo, Uruguay, S. A., by Chrisiani and Nielsen, South American agents of the Macdonald Engineering Co., using their moving form method of construction.

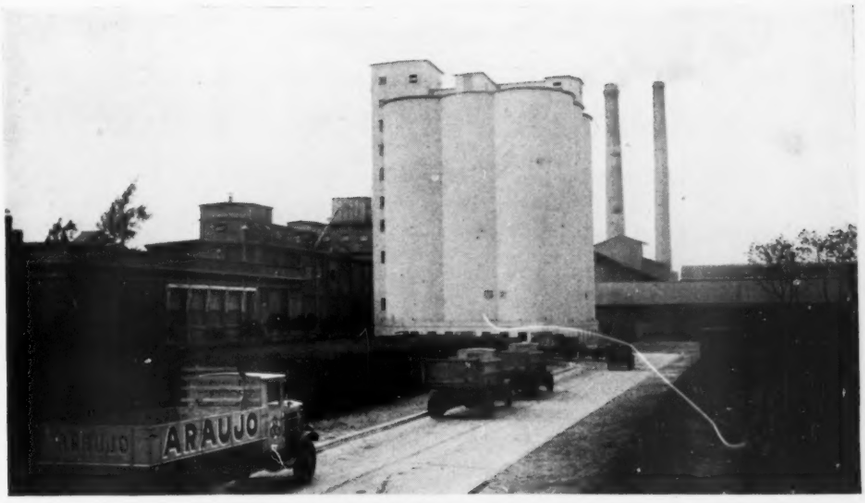




Front elevation and plant of the new storage silos

The cement storage is an addition to the mill of the Uruguay Portland Cement Co., a subsidiary of the International Cement Corp. This storage unit has a capacity of approximately 100,000 bbl.

There are four silos, 32 ft. in dia. by 80 ft. high, with partition walls between the silos, making a large central bin and three pocket bins formed by curved walls attached to silos in the manner that standard pocket bins are made. These pockets are larger, however, as the silos are spread by partition walls. A general scheme or plan of bins is shown on sketch above.



New cement storage silos of 100,000-bbl. capacity for the International Cement Corp.'s subsidiary at Montevideo, Uruguay

Rock Products Industries Active in North Carolina

DURING 1928 and for the first six months of 1929 the mining and quarrying industries in North Carolina were more active than in any like period in the history of the state. Probably more money was invested in exploratory work and in new plants than ever before. There was built and put into operation three feldspar grinding plants, one mica grinding plant, five mica recovery plants, one tile plant, one small asbestos grinding plant and one sand and gravel washing plant.

In Ashe, Avery, Buncombe, Maywood, Jackson, Macon, Mitchell and Yancey counties are numerous small isolated deposits of amphibole asbestos. However, in the past year or two examinations revealed deposits near Minneapolis, Avery county and at Otto, Macon county, large enough to be of economic importance. Two small plants, with a combined production of 40 tons per day, were built, but due to competition and limited market neither plant has proved successful.

In spite of the apparent failure of these two plants a third property, on which is found asbestos and librous enstatite, has been purchased by F. C. Worth of Chicago. A copy of the report on the property by Payne Jewett Burgess, consulting engineer, has been received at the office of the state geologist for the files. The report was very favorable. Mr. Worth stated that it was his intention to erect a plant shortly.

Three feldspar plants were built and put into operation during the past year. Golding Sons Co., Trenton, N. J., erected a small "glass spar" grinding plant near Spruce Pine. The Feldspar Milling Co., Burnsville, N. C., the only feldspar company in the state financed by North Carolina capital, built a modern completely electric driven feldspar grinding plant near Bowditch in Yancey county. The mill has two units, a glass spar unit and a pottery spar unit which have a combined capacity of 110 tons per 24-hour day. The Consolidated Feldspar Co., Trenton, N. J., erected a small feldspar grinding plant near Toecane, Mitchell county. These three mills add between 250 and 300 tons per 24-hour day to the grinding capacity of the mills in the state; they were built in North Carolina in order to be near the source of supply of crude spar. Other than these mills the Tennessee Mineral Products Co. has a 150-ton grinding plant near Penland, Mitchell county. Goldings Sons Co. also has grinding plants at Erwin, Tenn., which receive their supply of crude material from the Spruce Pine district.—*Asheville* (N. C.) *Citizen.*

(*Editor's Note*—A brief description of the feldspar operations in North Carolina was published in ROCK PRODUCTS, September 14 issue, and a complete description of the Feldspar Milling Co.'s plant in the November 23 issue.)

Cement Company Sued for Alleged Dust Nuisance

TWO DAMAGE suits for $100,000 each were filed recently against the Volunteer Portland Cement Co. by truck gardeners on Ruggles Ferry pike, near John Sevier yards, Knoxville, Tenn., where the cement plant is located.

The suits were filed by Carl R. Smith and A. M. Ault and wife, Katie Ault.

Damages are asked because of alleged injury to greenhouses and vegetation by the dust from the cement plant, according to R. C. Jamison, with the firm of Green, Webb and Bass, attorneys, through whom both suits were filed.

In addition to injury to the vegetation, plaintiffs claim that the dust from the cement plant settles on the glass of the greenhouses and hardens in wet weather into opaque cakes.—*Knoxville* (Tenn.) *Journal.*

Frank H. Smith, President, Portland Cement Association, Makes Statement at Hoover Conference

FOLLOWING is the statement made by Frank H. Smith, president of the Lawrence Portland Cement Co., New York City, as president of the Portland Cement Association, at the recent conference on industry called by the Chamber of Commerce of the United States at the instance of President Hoover:

"For one individual to attempt within the time allotted for that purpose to cover the field of building materials would be impossible. It would require considerable preparation and the gathering of a great many suggestions. It is undoubtedly true, however, that manufacturers of all building materials are in a somewhat similar position, in that they have no building program of their own, inasmuch as a very large majority of those manufacturers are already overbuilt. Therefore, they have no program of that description to present to you. The only information that I can give you today about any specific industry is that of the Portland Cement Association, which I represent.

Shipments of Cement Show Slight Decline

"From present indications, shipments of cement during 1929 will total about 3% less than those for 1928. The estimated shipments for 1929 indicate idle producing capacity equal to about 32% of the total, whereas 1928 shipments indicated that 28% of the producing capacity was idle last year. This broadening gap between manufacturing capacity and shipments discloses one of the most serious problems with which the industry is confronted.

"The tariff situation has not changed materially during the past year except that the exhausting effects of competition with low cost foreign cement are more evident. The threat of more serious devastation of our seacoast markets is before us more plainly than ever. Lack of action on tariff has had a depressing effect as economic pressure due to foreign influences has gradually tightened.

"Estimated road and street yardage awards for the year will be appreciably less than in 1928. In the general building field there was materially less volume in 1929 than in 1928.

"According to information gathered prior to President Hoover's recent announcement of the campaign to stimulate business, the outlook for 1930 anticipates shipments possibly 5 to 10% below those of 1929. The manufacturing capacity of the cement mills is ample and it is hoped that the effect of the President's action will put into service a portion of the idle capacity of the country, now in excess of 75,000,000 bbl.

More Money Available for Roads

"Demand for concrete street pavement, roads and similar uses should be as great in 1930 as during 1929. Recently estimated total revenues from federal aid, gas taxes and automobile license fees aggregate $800,000,000 for 1930, as against a similar estimate of $750,000,000 spent in 1929. Bond issues for highway construction totaling $228,000,000 have been passed by six states during the past six months and additional issues amounting to $475,000,000 are pending in seven other states. Large sums from these sources should be available with the opening of the coming construction season, dependent on an improved market for these securities.

"Unless factors now at work are able to interrupt the decline in general building demand, cement shipments for these purposes may be expected to show a loss more than equal to the small gains anticipated in other fields.

"We are hopeful that the President's efforts may result in increased demand sufficient to bring 1930 shipments to the 1929 level, or perhaps even exceed that level, although our own estimate made without taking into account any of the possibilities of recent presidential efforts would lead us to expect a decline of possibly 5 to 10%. It should be noted in this connection that the shipments of cement, and a very large measure of other building materials, take place from 4 to 12 months after the project is started.

Curtailed Production Cuts Employment in Industry

"In the cement industry there is no unemployment, except that which usually and naturally comes as the result of curtailed production, and in our industry we are attempting to decrease hours of labor rather than actually dismiss any of our employes. There have been no reductions in the hourly wage rate, and none is contemplated so far as I am able to discover. It is my opinion that additional housing, certainly in the notheastern part of the United States, is not needed.

"It would be my suggestion that the mortgage money which might naturally flow into that field of endeavor should be used to aid and assist public utilities, railroads and other large users of material and labor.

"There is one field, however, which has been touched upon slightly this morning by one of the speakers whereby large quantities of labor could be consumed, and that is the remodeling of homes. It would require very little material, and, therefore, be of not much assistance to material manufacturers, but, so far as labor is concerned, it would increase the man-hours used to a considerable extent."

Lehigh Portland's Airport Design Awards

WINNERS in the competition for a modern airport design sponsored by the Lehigh Portland Cement Co. were announced by Raymond Hood, the architect and chairman of the jury of awards. Two hundred and fifty-seven designs were submitted.

A first prize of $5000 went to A. C. Zimmerman and William H. Harrison, architects of Los Angeles. C. Clifford Rich, architectural designer of Chicago, took the second award of $2500. A third prize of $1000 was won jointly by Odd Nansen of East Orange, N. J., and Latham C. Squire of New York. And a fourth prize went to Will Rice Amon of New York. Twelve others were honorably mentioned and received a $100 reward each.

The design of the winners concentrates all of the buildings in one corner of a rectangular field, leaving a quadrant shaped area for the runways and flying. A passenger terminal building with underground passages to the loading and unloading points is flanked by hangars at the edge of the flying area. The design provides for parking spaces for automobiles, a hotel, recreation building, shops, and amusement concessions arranged in a triangular park.—*Chicago* (Ill.) *Tribune*.

Wisconsin Products Association Completes Convention Program

PLANS for the 1930 convention of the Wisconsin Concrete Products Association to be held January 29 and 30 in Milwaukee, Wis., have been virtually completed. Many interesting papers by qualified operators as well as brief addresses by prominent business men are among the features arranged. The series of 10-minute papers on problems entering the manufacture and sales of concrete products is sure to attract the attention of all who attend.

The principal speaker is Harry J. Coleman, business analyst of New York, who through the courtesy of the Lehigh Portland Cement Co. will speak on merchandising. The title of his address, "What Does it Profit a Man if He Sells Every Job in Town and Then Loses His Shirt," is significant.

National Lime Association Appoints Chief Engineer

THE National Lime Association, Washington, D. C., announces the appointment of C. E. Ellsworth as chief engineer of its construction division. Mr. Ellsworth was formerly located in Cleveland, Ohio, and

C. D. Ellsworth

held the office of secretary-treasurer in the Rice-Jones Co., general contractors of that city. He is a graduate civil engineer with 18 years' broad experience in building and engineering design and construction, and a penchant for engineering and economic research and investigation, analysis and evaluation. He comes well recommended and should add considerable weight to the strong organization being gradually developed under the able direction of Norman G. Hough, president and general manager of the association.

Ohio Sand and Gravel Producers Association Meeting

THE ANNUAL meeting of the Ohio Sand and Gravel Producers Association was held at the Neil House, Columbus, Ohio, on December 5. Delegates from leading producers in the state were present and took part in the business discussion which featured President Hoover's program of national building and construction.

A resolution was passed indorsing the program advanced by President Hoover and Governor Cooper of Ohio for the early institution of all public works construction in order to relieve the unemployment situation. A resolution committee composed of C. M. Ault, B. T. Van Camp and A. E. Frosch, pledged the support of the association to the national business program.

Following the business meeting, officers and executive committee for 1930 were elected. These are: F. W. Cornuelle, American Aggregates Corp., president; J. J. Gorman, vice-president, Zanesville; Stephen Stepanian, secretary-treasurer, Columbus; Guy C. Baker, executive secretary, Greenville; executive committee, L. K. Warner, Marion; G. E. Bebout, Zanesville; F. C. Fuller, Portsmouth; Don Poston, Chillicothe, and J. N. Dugan, Cincinnati.

A committee of three, composed of Messrs. Baker, Gorman and Stepanian, was appointed by President Cornuelle to draw a tentative outline for a code of ethics to govern the trade practices of the members of the Ohio Sand and Gravel Producers Association, similar to the recently approved codes adopted by the steel, gypsum and other industries. The committee is to present the code for approval at the next meeting of the association, which will be held January 7, 1930.

The delegates present included L. K. Warner, Marion Sand and Gravel Co., Marion; Don B. Swischer and J. J. Gorman, Zanesville Washed Gravel Co., Zanesville; W. H. Adams, Adams Bros., Zanesville; C. N. Ault, Barnes Sand and Gravel Co., Piketon; Don Poston, East End Sand and Gravel Co., Chillicothe; A. E. Frosch, East Liverpool Sand and Gravel Co., East Liverpool; W. P. McCarren, McCarren Sand and Gravel Co., Harveysburg; Fred Hall, T. J. Hall Co., Cincinnati; Earl Zimmerman, American Aggregates Corp., Cincinnati; F. S. Fuller, Portsmouth Sand and Gravel Co., Portsmouth; E. B. Suiter, Suiter Transport and Materials Co., Manchester; Stephen Stepanian and Paul Anderson, Arrow Sand and Gravel Co., Columbus; B. T. Van Camp, Van Camp Sand and Gravel Co., Cincinnati. —*Columbus* (Ohio) *Dispatch.*

Sierra Gypsum Products Co., Ltd.

THE SIERRA Gypsum Products Co., Ltd., is the successor to the Buttonlath Manufacturing Co., with plant and main office at Vernon and Soto street, Los Angeles, Calif. The new company produces a gypsum tile of slightly different design from that ordinarily encountered, but this difference is said to give a tile of greater strength per unit of weight than any other gypsum tile now on the market. The tile is made on a machine designed by the company's engineers and is said to be one of the most efficient machines in existence.

The machine is entirely automatic and has been in operation for several months. The percentage of breakage is remarkably low.

There has been no change in the personnel of the officers and directors. J. E. Jevne is president and treasurer; H. M. Eichelberger, vice-president; William Lacy, second vice-president, and W. E. Barnes, secretary.

Montana Gravel Lands Bring $500 Per Acre

PURCHASE of 46 acres just east of the city limits of Three Forks, Mont., for $23,000 was reported to have been made by the Milwaukee railway.

The property for which the railway company paid $500 an acre is located between the main line tracks of the Northern Pacific and the Gallatin Valley branch of the Milwaukee, immediately east of the city line. It is thought that the property will be used for a gravel pit, in conjunction with a plot about half that size, which the company already owns, which adjoins the recent purchase. The smaller property has been opened and used to provide gravel for the past year for use in ballasting the railway's roadbeds.—*Bozeman* (Mont.) *Chronicle.*

Injunction Issued Against Gravel Company

THE APPLICATION of the Great Eastern Sand and Gravel Corp. for permission to extend its dredging operations in Port Jefferson harbor, Long Island, N. Y., will be fought out in the court. After a stormy hearing on the matter in the Vandall's Hall, a temporary injunction restraining the board of trustees of Brookhaven Town from granting the desired permission was served on Chairman Harry Payne.

The injunction was obtained by William H. Robbins, attorney for 231 protesting persons, from Supreme Court Justice Humphrey in Brooklyn.

Opponents of the permit, which would extend the operations of the gravel company over 200 acres of harbor bottom, contended that continued dredging would ruin the beauty and utility of the harbor. They argued that in case dredging is to be allowed in future, all permits should be let by public bidding. They declare this would bring the town from 50 to 100% greater royalties than the 5 c. per cu. yd. it now receives.

Frank Melville, wealthy shoe manufacturer, offered to pay for the services of an engineer to survey the harbor and determine where there should be dredging, if the board would delay granting the present permit, and if the board would agree to follow the engineer's recommendations.—*Southhampton* (N. Y.) *Times.*

Agstone Publicity

A NEAT method of advertising agricultural limestone is embodied in the recent Christmas greetings sent out by the agricultural department of the Marble Cliff Quarries Co., Columbus, Ohio. On proper opening, the greetings disclose a small calendar, surmounted by a picture of a clover meadow in Ohio; the whole makes a handy little desk reference.

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended Nov. 9	Limestone Flux Week ended Nov. 16	Sand, Stone and Gravel Week ended Nov. 9	Sand, Stone and Gravel Week ended Nov. 16
Eastern	3,004	2,695	12,383	10,625
Allegheny	3,525	3,107	7,991	7,999
Pocahontas	390	387	1,143	1,355
Southern	788	642	8,429	6,791
Northwestern	963	967	5,208	5,626
Central Western	574	529	11,459	9,651
Southwestern	521	551	7,345	6,366
Total	9,765	8,878	53,958	48,413

District	Limestone Flux Week ended Nov. 23	Limestone Flux Week ended Nov. 30	Sand, Stone and Gravel Week ended Nov. 23	Sand, Stone and Gravel Week ended Nov. 30
Eastern	2,622	2,131	7,527	4,839
Allegheny	2,757	2,468	6,796	4,699
Pocahontas	308	258	877	729
Southern	773	566	6,508	6,395
Northwestern	420	694	3,853	2,143
Central Western	530	463	9,439	7,417
Southwestern	596	481	6,323	5,303
Total	8,006	7,061	41,323	31,525

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1928 AND 1929

District	Limestone Flux 1928 Period to date Dec. 1	Limestone Flux 1929 Period to date Nov. 30	Sand, Stone and Gravel 1928 Period to date Dec. 1	Sand, Stone and Gravel 1929 Period to date Nov. 30
Eastern	142,005	158,356	541,363	542,531
Allegheny	165,060	169,985	361,728	353,935
Pocahontas	21,994	18,076	39,575	48,282
Southern	28,037	29,060	509,613	419,389
Northwestern	62,515	53,131	316,316	299,897
Central Western	21,421	25,198	488,378	507,127
Southwestern	19,619	24,126	305,527	330,821
Total	460,651	477,932	2,562,500	2,501,982

COMPARATIVE TOTAL LOADINGS, 1928 AND 1929

	1928	1929
Limestone flux	*460,651*	*477,932*
Sand, stone, gravel	*2,562,500*	*2,501,982*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning December 14:

SOUTHWESTERN FREIGHT BUREAU DOCKET

18924. **Sand,** from Webb City, Mo., to points in Tennessee and Alabama. To establish a rate of $4 per ton of 2000 lb. to Knoxville, Tenn., and a rate of $3.40 per ton of 2000 lb. to Birmingham, Ala., on sand and chatt sand, carloads, minimum weight 100,000 lb., from Webb City, Mo. Shipper requests establishment of rate of 400 c. per ton of 2000 lb. to Knoxville, Tenn., and 340 c. per net ton to Birmingham, Ala., from Webb City-Joplin, Mo., district. Proposed rates are 8½% of the first class I. C. C. Docket 13535 scale.

18934. **Sand,** from Wedron, Ill., to Blackwell, Okla. To establish a rate of 18 c. per 100 lb. on sand, carloads, as described in Item 9892A, S. W. L. Tariff 5N (See Note 2), from Wedron, Ill., to Blackwell, Okla. Smelter company contemplates substantial movement Wedron to Blackwell, but cannot move on present rate.

18976. **Limestone,** from points in W. T. L. territory to points in Arkansas, Missouri, etc. (a) That section N of Rule 370E of W. T. L. Circular 1T and Rule 1082 of W. T. L. Circular 17G be amended to read as follows: Shells (clam, mussel or oyster), crushed, ground or waste (not whole); grits, gypsum (ground or crushed gypsum rock); grits, poultry (ground or crushed gypsum rock or ground or crushed rock other than gypsum classified in Class E in Western Classification); limestone, crushed or ground, not to exceed in weight 30% of the actual weight of the entire carload, or of the minimum weight if greater than the actual weight, may be shipped in mixed carloads with grain or grain products as described in this rule. The rate on the shells, grits or limestone actual weight shall be the carload rate applicable to the highest rated grain or grain product in the car; the weight of the shells, grits or limestone to be applied toward the minimum weight prescribed for such mixed carload. (b) Similar change to be made in tariffs of individual lines. It is pointed out that the carriers made a liberal concession to shippers of stones, bricks and shells when they permitted these articles to be included in cars of grain products, but that permission never contemplated that carriers would be expected to protect the grain rate on straight carload shipments of limestone.

SOUTHERN FREIGHT ASSOCIATION DOCKET

48343. **Stone, crushed, rubble or broken,** from Saltville, Va., to Kingsport, Tenn. Present rate, 195c per net ton (combination). Proposed rate on stone, crushed, rubble or broken, carloads (See Note 3), from Saltville, Va., to Kingsport, Tenn., 115c per net ton.

48366. **Stone dust or screenings,** from Greystone, N. C., to Henderson, N. C. Present rate, 50c per net ton; proposed rate on stone dust or screenings, carloads, $15 per car, regardless of weight.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

WESTERN TRUNK LINE DOCKET

496P, Sup. 1. **Limestone, agricultural,** carloads (See Note 2), from Louisville, Neb., to points on the C. G. W., Ill. Cent., C. & N. W., C. St. P. M. & O., C. M. St. P. & P., and Wabash in Iowa. Present, combination; proposed:

Miles	Cents	Miles	Cents
40	59	150	115
50	63	160	119
60	76	170	123
70	71	175	125
80	76	180	127
90	82	190	131
100	88	200	135
110	96	210	138
115	99	220	141
120	102	225	144
130	107	230	144
140	111	240	147
145	113	250	150

Rates in cents per ton of 2,000 lb.

2079K. **Stone, crushed,** carloads (See Note 2), but not less than 40,000 lb., from Montello, Wis., to South Rockwood, Mich. Present—Class or combination. Proposed—$2.40 per net ton.

ILLINOIS FREIGHT ASSOCIATION DOCKET

4951. **Crushed stone,** carloads (See Note 2), from McManus, Ia. Rates per net ton:

To	Present	Proposed
Hamilton, Ill.	$0.93	$0.88
Elvaston, Ill.	1.13	0.88

CENTRAL FREIGHT ASSOCIATION DOCKET

23395. To establish on **sand and gravel,** carloads, from Chillicothe and Rittenours, O., to Vigo, O., rate of 50 c. per net ton. Present rate—60 c. per net ton.

23399. To establish on **sand** (all kinds) and **gravel,** carloads, from Wapakoneta, O., to points in Ohio, rates as shown below:

To—	Pro. Rate	Pres. Rate
Bellefontaine, O.	70	*
East Liberty, O.	80	*
McMoran, O.	65	*
Russells Point, O.	60	*
St. Marys, O.	60	*

*Classification basis.

23401. To establish on **sand and gravel,** carloads, from Dundee, Ind., to Benadum, Ind., rate of 70 c. per ton. Route—Via N. Y. C. & St. L. R. R., Muncie, Ind., C. & O. Ry. Present rate—Sixth class.

23407. To establish on **Sand and gravel,** in open top cars, carloads, from South Lebanon, O., to points in Ohio, rates as shown below:

Penn. R. R. Destinations	Rate from Maimisville	Pro. Rate	Penn. R. R. Destinations	Rate from Maimisville	Pro. Rate
Morrow	60	60	Circleville	90	90
Waynesville	60	60	Lancaster	100	100
Roxana	70	65	Bremen	....	105
Xenia	70	70	Crooksville	....	115
S. Charleston	70	70	Zanesville	....	125
Columbus	80	80	Trinway	....	125
Springfield	....	85	Summit	....	105
Dayton	90	75	Pataskala	....	115
Brookville	....	90	Westerville	....	105
W. Manchester	....	95	Middletown	60	60
New Paris	....	100	Lebanon	70	60
Richmond	....	105	Dodds	90	60
Wilmington	60	60	Manor	90	65
Wash'ton C. H.	70	70	Hempstead	90	70
Johnsons	90	85			

23408. To esthalish on **sand and gravel,** in open top cars, carloads, from South Lebanon, O., to points in Ohio, rates as shown below:

N. & W. Ry. Destinations	Pro. posed Rate	N. & W. Ry. Destinations	Pro. posed Rate
Newtown	70	Porthsmouth	115
Gernon	75	Mowrystown	95
Afton	80	Taylorville	95
Mt. Oreb	85	East Danville	95
Sardinia	95	Valley Crossing	105
Winchester	95	Ashville	115
Beaver Pond	100	Kingston	125
Otway	105	Wakefield	135
McDermott	115	Lucasville	145

Present rates—Classification basis.

23413. To cancel all rates on **crushed stone,** carloads from Berea, O., published in B. & O. R. R. (East) Freight Tariff 1935, to points in the state of Ohio, classification basis to apply in lieu thereof.

23418. To cancel from B. & O. R. R. (East) Tariff I. C. C. 19180 all rates on **sand, carloads,** from the following points in Ohio to points in Canada (Province of Ontario), classification basis to apply in lieu thereof: Beach City, O., Canton, O., Dover, O., Howenstein, O., Kent, O., Mineral City, O., New Philadelphia, O., Pauls, O., Sandyville, O., Wooster, O.

23421. To establish on **crushed stone,** carloads, from Melvin and Thrifton, O., to points in West Virginia, rates as shown below:

To	From Melvin, O. Pro. Rate	Pres. Rate
Hallen, W. Va.	$1.85	$3.40
Creek, W. Va.	1.85	3.40
Slate, W. Va.	1.85	3.50
Newark, W. Va.	1.85	3.60
Standing Stone, W. Va.	1.95	3.80
Elizabeth, W. Va.	1.95	3.90
Palestine, W. Va.	1.95	3.90
Owensport, W. Va.	1.95	4.00

To	From Thrifton, O. Pro. Rate	Pres. Rate
Hallen, W. Va.	$1.75	$3.30
Creek, W. Va.	1.75	3.30
Slate, W. Va.	1.75	3.40
Newark, W. Va.	1.75	3.50
Standing Stone, W. Va.	1.85	3.70
Elizabeth, W. Va.	1.85	3.80
Palestine, W. Va.	1.85	3.80
Owensport, W. Va.	1.85	3.90

23422. To establish on **waste stone screenings,** carloads (See Note 1), from Piqua, O., to Dayton, O., rate of 40 c. per net ton. Present rate—60 c. per net ton.

23425. To establish on **stone, crushed, rubble, rip-rap, quarry, scrap screenings,** carloads, minimum weight 50,000 lb., from Whitehouse, O., to Paulding, O., rate of 90 c. per net ton. Route—Wabash, Cecil, O., C. N. Present rate—100 c. per net ton.

23436. To cancel rates on **sand and gravel**, carloads, from Somerset Centre, Mich., to all points shown in N. Y. C. Tariff I. C. C. L. S. 1413, page 143, as amended, classification basis to apply in lieu thereof.

23437. To establish on **sand and gravel**, in open-top cars, carloads, from Miamiville, O., to Centerville, O., rate of 75c per net ton. Present rate, 90c per net ton per P. R. R. Tariff 121A.

23450. To establish on **agricultural limestone screenings**, in open-top cars, carloads, from Gibsonburg and Woodville, O., to Wooster, O., via B. & O. R. R., rate of $1.15 per net ton. Present rate, classification basis.

23451. To establish on **crushed stone**, carloads, from Greencastle, Ind., to Ottawa, O., rate of $1.55 per net ton. Route—Via C. C. C. & St. L. Ry., Quincy, O., and D. T. & I. R. R. Present rate, sixth class.

23453. To establish on **sand and gravel**, carloads, from Fort Jefferson, O., to Continental, O., rate of $1 per net ton. Route—Via C. N. R. R., Ohio City, O., and N. Y. C. & St. Louis R. R. Present rate, $1.10 per net ton.

23477. To establish on **crushed stone**, carloads, from Monon, Ind., to Belshaw and North Hayden, Ind., rate of 85c per net ton, and to Cook, Ind., 90c per net ton. Present rate, 15c.

TRUNK LINE ASSOCIATION DOCKET

22345. **Sand**, other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads, **and/or gravel**, carloads (See Note 2), from Bacon Hill, North East, Charlestown and Principio, Md., to Safe Harbor, Penn., 85 c. per net ton. (Present rate, $1.05 per net ton.) Reason—Proposed rate is fairly comparable with rates on like commodities for like distances, services and conditions.

22355. (a) **Sand** (other than blast, engine, fire, foundry, glass, molding or silica). (b) **Sand, (blast, engine, fire, foundry, glass, molding or silica)**, carloads (See Note 2), from Kunkletown and Little Gap, Penn., to Bangor, Penn. D. L. & W. delivery (a) $1.10 per net ton, (b) $1.27 per net ton. Reason—Proposed rates are comparable with rates on like commodities from and to points in the same general territory.

22367. **Sand, common, building and engine** (in open top equipment), carloads (See Note 2), from Cumberland, Md. (rates per 2000 lb.)

To Pennsylvania Stations on Montour R. R.	Proposed	Present
Montour Junction	$1.60	$1.95
Cliff Mines	1.60	1.95
Imperial	1.60	1.95
McAdams	1.60	1.95
Southview	1.70	1.95
Hills	1.70	1.95
Library	1.70	1.95
Summit Park	1.70	1.95
Groveton	1.60	1.95
Moon Run	1.60	1.95

Reason: Proposed rates are comparable with rates from and to points in the same general territory.

22388. **Crushed stone**, carloads (See Note 2), from Carpenterville, N. J., to Plainfield, N. J., $1.15 per net ton. (Present rate, $2.30 per net ton.) Reason—Proposed rate is comparable with rates on like commodities from and to points in the same general territory.

22409. (A) **Sand**, other than blast, engine, foundry, molding, glass, silica, quartz or silex, **and gravel**, carloads; (B) **Sand, blast, engine, foundry, molding, glass, silica, quartz or silex**, carloads (See Note 2), from Lewes, Del., to Pocomoke, Md., (A) $1.40 and (B) $1.50 per net ton. Reason—Proposed rates are comparable with rates from Lewes, Del., to Wilmington, Del., and Philadelphia, Penn., and from Northeast, Md., to Dagsboro and Delmar, Del.

22412. To revise rates on **sand**, carloads (See Note 2) to Erie, Penn. Proposed rates, in cents per 2000 lb.:

From	Molding	Blast, engine, glass, quartz, silica and silex
Berkeley Springs, W. Va.	252	275
Great Cacapon, W. Va.	252	275
Hancock, W. Va.	252	275
Cumberland, Md.	.....	275
Triplett, Va.	.....	*295

*Glass sand only.

Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

22421. **Stone chips or granules**, carloads, minimum weight 40,000 lb., from Texas and Cockeysville, Md.

To	Prop.
Trenton, N. J.	205
Williamsport, Penn.	225
Norfolk, Va.	320
L. V. R. R.	
Fords, N. J.	277
R. F. & P. R. R.	
Richmond, Va.	320

Proposed rates in cents per 2000 lb. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

22427. **Gravel and sand**, other than blast, engine, fire, foundry, glass, molding or silica, carloads (See Note 2), from Kunkeltown and Little Gap, Penn., to Pottsville, Penn., $1.25 per net ton, present rate $1.60 per net ton, and to avoid state violations it will also be necessary to publish the same basis to the following points, which points are intermediate to Pottsville, Penn., and on a higher basis: Tamaqua, Penn., Tuscarora, Penn., Middleport, Penn., New Philadelphia, Penn., Port Carbon, Penn., Palo Alto, Penn. Reason—Proposed rate is same as now in effect from Lehigh Gap and Aquashicola, Penn.

22430. **Glass sand**, carloads (See Note 2), from Triplett, Va. Proposed rate in cents per 2000 lb.:

To	Prop.
Chester, Penn.	240
Wilmington, Del.	240
Camden, N. J.	240
Trenton, N. J.	240
New Brunswick, N. J.	260
Matawan, N. J.	280
Keyport, N. J.	280

Reason—Proposed rates are comparable with rates from Hancock district.

22433. To establish rates on **molding sand**, carloads (See Note 2), from Round Lake, Saratoga Springs and Gansevoort, N. Y., to all destinations in Trunk Line territory where commodity rates are now in effect, from Albany district sand stations as published in D. & H. Co. joint tariffs to D. L. & W., Erie, L. V., etc., proposed uniform basis to be 1½c per 100 lb. higher than the present rates from Albany district stations. Reason—Proposed rate is comparable with rates from Mechanicsville, N. Y.

22435. **Sand and gravel**, carloads (See Note 2), from Perth Amboy district, N. J., viz., Metuchen to Maurer, N. J., inclusive, to Manville, N. J., 90c per net ton, present rate $1.04 per net ton. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

22446. (A) **Sand and gravel**, when loaded in open-top equipment, carloads; (B) Sand and gravel when loaded in box cars or other closed equipment, carloads (See Note 2), to Nazareth, Penn., from Pasadena to Dividing Creek, N. J., inclusive, Bridgeton to Greenwich, N. J., inclusive, (A) $1.95, (B) $2.15 per net ton; from Mauricetown to Bivalve, N. J., inclusive, (A) $2.05 per net ton, (B) $2.25 per net ton; from Pinewald, Toms River and Quail Run, N. J., (A) $1.80 and (B) $2 per net ton. Reason—Proposed rates are comparable with rates on like commodities from and to points in the same general territory.

22452. **Sand**, other than blast, engine, foundry, glass, molding and silica, **and gravel**, carloads (See Note 2), from Nixon, N. J., to Rocky Hill, N. J., $1.15 per net ton. Present rate, $1.50 per net ton. Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

22455. **Sand**, other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads (See Note 2), from Steelton, Penn., to Hagerstown, Md., to Berkeley, W. Va., inclusive, $1.30, and Tablers, W. Va., to Lenore, Va., inclusive, $1.45 per ton. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

22457. **Fluxing limestone**, carloads (See Note 2), from Bittinger, Penn., to Wrightsville, Penn., $1.01 per gross ton. Present rate, 17½c per 100 lb., sixth class. Reason—Proposed rate compares favorably with rates from Bittinger to Steelton, Penn.

22458. **Stone, crushed or quarry broken**, carloads (See Note 2), from Jamesville, N. Y. Rates in cents per net ton.

To	Prop.	Pres.
Oxford, N. Y.	130	150
Guilford, N. Y.	140	170
Parker, N. Y.	140	170
Sidney, N. Y.	140	180
South Unadilla, N. Y.	140	180
Youngs, N. Y.	140	180
Maywood, N. Y.	140	180
Franklin, N. Y.	150	180
Merrickville, N. Y.	150	180
Northfield, N. Y.	150	180
Walton, N. Y.	150	200
Beerston, N. Y.	150	200
Rickkift, N. Y.	150	200
Apex, N. Y.	150	200
Cadosia, N. Y.	160	200
Tylers, N. Y.	160	200
Fisks Eddy, N. Y.	160	200
East Branch, N. Y.	160	200

Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

Recommend Rate Increase on Aggregates to and from Mississippi Valley Points

ONLY the Columbus and Greenville railroad is justified in increasing freight rates on sand, gravel, slag, stone and chert in their transportation from and to points in Mississippi Valley territory, it is declared in a recent report submitted to the Interstate Commerce Commission by E. H. Waters, examiner for the commission.

The report follows an investigation by the examiner into the proposed freight rate increase. In his report Examiner Waters said in part:

"The level of rates within the valley has effectually presented outside shippers of this traffic from getting into that territory. A witness for the Birmingham interests stated that he had been endeavoring for nearly 12 years to break down the barrier or rate wall that we have found against us westbound. To illustrate the situation, it is pointed out that Birmingham to the Mississippi state line is approximately the same as to the Georgia state line. Yet, while the Birmingham Slag Co. shipped eastbound into Georgia and northern Florida during the year 1928, 311,187 tons of slag, it only shipped 7,563 tons into Mississippi during the 17 month period from October 1, 1927, to March 1, 1929. Reference is also made to the ability of Columbus, Miss., to ship to various destinations in Alabama on rates lower than are available to Alabama shippers. A producer of these materials at Sheffield, Ala., which is only 30 miles east of Oldham, Miss., has paid the basis of rates since October 1, 1927. Testimony offered for this producer shows that the disparity between the level of his rates and those within the valley has practically shut him out of the valley. For instance, Oldham has a 79 cent rate to Memphis, while Sheffield pays $1.20."

The increase allowed for the Columbus and Greenville is justified on the ground that the earnings of that short line are now not sufficient.

Oldham and Gravel Siding are the chief gravel producing points on the Southern Railway in Mississippi. Some of the increases proposed from Gravel Siding to Mississippi points would be as high as 16 cents per 100 lb.—*Columbus* (Miss.) *Dispatch.*

Propose Revision of Cement Rates from Linwood Iowa

A PROPOSED report of Examiner J. P. McGrath, in Docket No. 21492, and related cases, relative to rates on portland cement shipped from the plant of the Dewey Portland Cement Co. at Linwood, Iowa, and from other origin points, to destinations in the West and Middle West, was made public by the Interstate Commerce Commission recently.

The examiner's summary of his conclusions follows in full text:

Rates on portland cement, in carloads,

from Linwood, Iowa, to destinations in Illinois, Wisconsin, Iowa, Missouri, Nebraska and Minnesota found not unreasonable or unduly prejudicial, with certain exceptions.

Intrastate rates on portland cement, in carloads, from LaSalle, Oglesby and Dixon, Ill., to Chicago, Ill., found unduly preferential of cement manufacturers at the origin points named and of intrastate traffic from those points and unduly prejudicial to complainant and interstate traffic from Linwood. Defendants given opportunity to remove undue preference and prejudice.

Interstate rates on portland cement, in carloads, from LaSalle and Oglesby, Ill., Ilasco, Mo., and Mason City, Iowa, to Wausau, Wis., found unduly preferential of cement manufacturers at the points of origin named and unduly prejudicial to complainant. Undue preference and prejudice ordered removed.

Intrastate rates on portland cement, in carloads, from Ilasco and Marquette, Mo., to St. Louis, Mo., and from Ilasco, Prospect Hill, Alpha, Marquette and Sugar Creek, Mo., to other destinations in Missouri, with certain exceptions indicated in the report, found unduly preferential of cement manufacturers at the points of origin named, and of intrastate traffic from those points and unduly prejudicial to complainant and interstate traffic from Linwood. Undue preference and prejudice ordered removed.

Rates on portland cement, in carloads, from Linwood to destinations in so-called "no scale" territory in Missouri found unreasonable. Basis of reasonable rates indicated.

Intrastate rate on portland cement, in carloads, from Louisville, Neb., to Omaha, Neb., found unduly preferential of the cement manufacturer at Louisville and of intrastate traffic from that point and unduly prejudicial to complainant and to interstate traffic from Linwood. Undue preference and prejudice ordered removed.

Hearing on Silica Sand Rates Is Set for February 10

FURTHER hearing in Docket No. 17000, Part II, rate structure investigation, sand and gravel, has been set by the Interstate Commerce Commission for February 10 at Tulsa, Okla., before Examiner Waters, in so far as it involves rates on silica sand, it was announced recently.

The inquiry into sand and gravel rates is a part of the Commission's general rate structure investigation, instituted in pursuance of the Hoch-Smith congressional resolution.

Only recently the Louisiana Public Service Commission challenged the validity of the Interstate Commerce Commission's order in the same case, claiming that parts of the ordinance are unconstitutional.

Marquette Cement Adds Diesel Towboat for Cement Barges

CONTRACT for a twin screw Diesel river tug has been awarded to the Marietta Manufacturing Co. of Point Pleasant, W. Va., by the Marquette Cement Manufacturing Co. of Chicago, Ill., from designs prepared by T. R. Tarn, naval architect of Pittsburgh, Penn. The contract price is said to be $135,000 and delivery is to be made in June of next year.

The dimensions of the tug are 120x26x7 ft. It will be powered with two Atlas-Imperial engines of 350 hp. each at 225 r.p.m. The stern of the tug is of the shallow tunnel type. The propellers have a diameter of 6 ft. and the mean draft of the tug is 5 ft.

This tug will be used by the Marquette Cement Manufacturing Co. to tow the self-unloading bulk cement barges, recently placed in service at their Cape Girardeau plant on the Mississippi river, to their storage and sacking plants at St. Louis and Memphis, Tenn.

Hanford MacNider Heads Northwestern States Portland

HANFORD MACNIDER of Mason City, Iowa, was elected president and general manager of the Northwestern States Portland Cement Co.

A. F. Frudden of Hollywood, a director was elected vice-president, and Willis G. C. Bagley, Mason City banker, treasurer. These three officers and William Chamberlain of Chicago, E. C. Frudden of Dubuque, M. T. Gunderson of Kenyon, Minn.; S. T. McKnight of Minneapolis, Edwin White of St. Paul, S. L. Lon Wright of Winona, Minn., and Fred Keeler and Frank J. Hanlon of Mason City were chosen to the board of directors.—*Chicago* (Ill.) *News.*

System of Accounts for the Slate Industry

A LACK of effective cost-keeping, which defect is a factor in detracting from the prosperity of the slate industry, has prompted the U. S. Bureau of Mines to make a detailed study of accounting methods for that industry. Based on this study, Serial No. 2971, by Oliver Bowles, recently released by the bureau, incorporates these methods and is offered to the slate industry for consideration and constructive criticism. The recommendations are tentative, but it is believed they will, if adopted by a fair proportion of the important slate producing units, enable the industry to operate and manage more economically.

The investigation goes into the evils due to absence of reliable and actual cost data; such things as extremely low prices entirely unrelated to real costs are cited as demoralizing examples. One recommendation—quotation of prices based on actual cost plus a fair profit and the maintenance of these prices on such a basis—could well be applied to many other rock products industries.

A simple accounting system is proposed and explained. The suggested forms for the uniform chart of accounts are illustrated and the details of each form are given.

Uses for Stone Screenings

A RECENT issue of the *Crushed Stone Journal* carries an article by A. T. Goldbeck, director, bureau of engineering, N. C. S. A., in which the various uses of the finer portions of the product of crushing and screening operations are discussed. The uses listed:

1. Fine aggregate in concrete, alone or in combination with sand.
2. Binder in waterbound macadam road construction.
3. Portion of the aggregate in bituminous concrete.
4. Cover material in surface treatment for roads.
5. Subgrade treatment under macadam, concrete and other types of roads.
6. Low cost road construction.
7. Shoulder maintenance.
8. Concrete block manufacture.
9. Miscellaneous uses in concrete.

The article goes into the details of these uses quite thoroughly.

Directory of Japanese Cement Manufacturers

AN UNUSUALLY complete directory of cement manufacturers of Japan has been recently brought out by the Japanese Portland Cement Association. Not only does it give the list of plants but their location and railway connections are plotted on a small map. A brief outline of the growth and development of the industry shows how marked the progress in the last 20 years has been. For example, in 1909, production was only 2,540,000 bbl. as compared with 22,475,000 bbl. produced in 1928. Invested capital in cement mills increased from 7,905,350 yen to almost 100,000,000 yen during the same period. At the present time there are 16 cement companies in Japan operating 35 plants. All the plants are members of the cement association.

Each of the cement companies is listed in alphabetical order in the directory and a brief description of the manufacturing processes, equipment used and the plants is given. Further, pertinent data regarding physical strengths, chemical analyses, etc., of the cements made by the different companies is included. An unusual color insert, featuring the trademarks of each company, is placed at the back of the book. For reference there is also an abstract of the prevailing Japanese standard specifications for portland cement.

Sand-Lime Brick Production and Shipments in November

THE following data are compiled from reports received direct from 23 producers of sand-lime brick located in various parts of the United States and Canada. The number of plants reporting is one less than those furnishing statistics for the October estimate, published in the November 9 issue. The statistics below may be regarded as representative of the entire industry, the reporting plants having about one-half the production capacity in the United States and Canada.

Production decreased somewhat in November, three plants reporting that they were not at present producing. Shipments by rail and truck remain about the same. Stocks on hand decreased considerably as did unfilled orders:

The following are average prices quoted for sand-lime brick in November:

Shipping Point	Plant Price	Delivered
Dayton, Ohio	$12.50	$15.50
Boston, Mass.	12.00	16.00
Detroit, Mich.	13.00@14.00	15.00@16.00
Detroit, Mich.	.....	15.50@16.00
Detroit, Mich.	.....	16.00
Detroit, Mich.	13.00	15.75
Grand Rapids, Mich.	14.00	15.00
Jackson, Mich.	13.00	.....
Madison, Wis.	12.00@12.50	13.00@14.00
Menominee, Mich.	11.00	13.50
Milwaukee, Wis.	10.50	13.00
Minneapolis, Minn.	8.00	10.00
Mishawaka, Ind.	11.00	.....
Saginaw, Mich.	12.00	.....
Sioux Falls, S. D.	.....	13.50
Syracuse, N. Y.	18.00	20.00
Toronto, Can.	12.50	15.00
West Toronto, Can.	.....	13.50
Winchester, Mass.	.....	16.00
Winnipeg, Can.	14.00	15.00

The following statistics are compiled from data received from 23 producers in the United States and Canada:

Statistics for October and November

	*October	†November
Production	17,563,000	14,011,000
Shipments (rail)	5,150,000	4,956,000
Shipments (truck)	10,863,000	9,938,000
Stocks	12,957,000	10,854,000
Unfilled orders	12,943,000	9,708,000

*Twenty-two plants reporting; incomplete, one plant not reporting stock on hand, and eight not reporting unfilled orders.

†Twenty-three plants reporting; incomplete, two plants not reporting stocks on hand and seven plants not reporting unfilled orders.

Notes from Producers

Sand-Lime Products Co., Detroit, Mich., reports that it is supplying Rock-O-Lite sand-lime brick for the new Silent Automatic plant, the new Kresge building at Dexter and Webb avenues, Detroit, Mich., and several new school buildings.

Iowa Awards Cement Contracts

THE Iowa State Highway Commission has awarded cement contracts totaling 2,000,000 bbl. for use in its 1930 primary road paving program. The list of successful bidders (exclusive of dealers) follows:

	Barrels
Marquette Cement Mfg. Co., Chicago, Ill.	110,000
Lehigh Portland Cement Co., Chicago, Ill.	200,000
Penn.-Dixie Cement Corp., Des Moines, Iowa	200,000
Monarch Cement Co., Humboldt, Kan.	25,000
Dewey Portland Cement Co., Davenport, Iowa	300,000
Hawkeye Portland Cement Co., Des Moines, Iowa	205,000
Nebraska Cement Co., Omaha, Neb.	30,000
Ash Grove Lime and Portland Cement Co., Omaha, Neb.	30,000
Northwestern States Portland Cement Co., Mason City, Iowa	450,000
Universal Portland Cement Co., Chicago, Ill.	55,000

The price varies at different unloading points throughout the state and inasmuch as the state reserves the right to require any bidder to ship to any point, it is impossible to quote the exact prices that will prevail on any one bidder's contract. Average net price, delivered at specified points, will be about $1.75 per bbl. About one-fourth of the business was awarded on the basis of the low bid, and of the remaining three-fourths, on which the bids were identical, the allotments were made to the various companies at the discretion of the commission.

In addition to these contracts, the commission awarded the following contracts for furnishing cement on contracts awarded December 3:

Atlas Portland Cement Co., 55,000 bbl. for use on Clarke and Audubon county jobs, and Hawkeye Portland Cement Co., 55,000 bbl. for use on Shelby county contracts.

Editors of Industrial Journals Report Business Is Favorable

PRESIDENT HOOVER was given assurance December 16 by editors and publishers of 150 technical and trade publications, who conferred with him at the White House on the general business situation, that conditions as a whole are favorable. He was informed, however, that there are some weak spots in business conditions, including the textile industry.

Those who discussed the business situation with the President are members of the National Conference of Business Papers Editors and the Associated Business Papers. Representative editors of the basic industries, including iron and steel, coal, textiles, the railroads, machine tools, construction, and coal, made reports on each of these industries.

The conference was the 52nd meeting of the business paper editors' organizations with Mr. Hoover. These conferences were inaugurated in the spring of 1921, shortly after Mr. Hoover became Secretary of Commerce.

The editors were accompanied to the White House by the Secretary of Commerce, Robert P. Lamont, and the Assistant Secretary of Commerce, Dr. Julius Klein.

Bell Wins First Step Towards Los Angeles Cement Mill

THE city planning commission of Los Angeles at a recent meeting voted to recommend for the city council that the Bell interests petition be granted. The matter now rests with the city council.

Despite the commission's recommendation, the cement people will have a long fight before the permit is granted (if at all), for there is much opposition from residents in the district.

In voting to grant the permit to the Los Angeles Mountain Park Co., many restricting conditions of operations were submitted and agreed to by the Bell interests.—*Los Angeles* (Calif.) *Times.*

O. P. Chamberlain Elected President of Dolese and Shepard Co.

COL. O. P. Chamberlain was elected president of Dolese and Shepard Co., Chicago, at a recent meeting of the stockholders, succeeding J. F. Talbot, who recently retired. Other officers elected were W. R. Carney, vice-president; E. R. Hills, secretary, and W. J. Stoffel, secretary.

Col. O. P. Chamberlain

Colonel Chamberlain, a conspicuous figure in the crushed stone industry, has been connected with the Dolese company since 1903 except for the World War period, 1917 to 1919. He served during the war as a colonel in the 23rd Engineers.

The Rock Products Market

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N. J.	.48	.48	1.15	1.25	1.40	.....
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.‡	1.25	1.15	1.75	.....	1.75	1.75
Buffalo, N. Y.	1.00	1.05	1.05	.....	.....	.....
Erie, Penn.	.70	1.00	1.50	1.50	.....	.....
Milton, N. H.	.....	.....	1.75	.....	1.25	1.00
Montoursville, Penn.	1.00	.60	.50	.40	.40	.40
South Portland, Me.	.....	1.00	2.25	.....	.....	2.00
Washington, D. C.	.55	.55	1.20	1.20	1.20	1.00
Georgetown, D. C.	.55	.55	1.20	1.20	1.00	1.00
CENTRAL:						
Algonquin, Ill.	.35	.20	.20	.40	.40	.40
Appleton, Minn.	.....	.50	1.25	.....	1.50	.....
Attica, Ind.	.....	.....	All sizes .75–.85	.....	.....	.....
Barton, Wis.	.....	.40d	.50d	.60d	.60d	.60d
Des Moines, Iowa	.60	.80	1.70	1.70	1.70	1.70
Dresden, Ohio	.....	.60– .70	.....	.70– .80	.70– .80	.....
Eau Claire, Wis.	.....	.55	.70	1.00	1.00	.....
Elkhart Lake and Glenbeulah, Wis.	.50	.35	.50	.60	.50	.50
Grand Rapids, Mich.	.....	.50	.60	.70	.70	.70
Hamilton, Ohio	.90–1.20	.90–1.20	.90–1.20	.90–1.20	.90–1.20	.90–1.20
Hersey, Mich.	.....	.50	.....	.70	.70	.70
Indianapolis, Ind.	.50– 75	.40– .60	.50– .75	.50– .75	.60– .85	.60– .85
Kansas City, Mo.	.....	.70	.....	.....	.....	.....
Mankato, Minn. (b)	.55	.45	1.25	1.25	1.25	.....
Mason City, Iowa	.50	.50	.85	1.25	1.25	1.25
Milwaukee, Wis.	.91	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn. (a)	.35	.35	1.35	1.35	1.35	1.25
St. Paul, Minn. (e)	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.75	.60	.75	.75	.75	.75
Waukesha, Wis.	.....	.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	.50	1.10	1.10	1.25
SOUTHERN:						
Brewster, Fla.	.40	.....	.....	.....	.....	.....
Charleston, W. Va.	.75	1.25	1.25	1.25	1.25	1.25
Eustis, Fla.	.....	.40– .50	.....	.....	.....	.....
Fort Worth, Texas	.75– .90	.75– .90	1.00–1.10	1.00–1.10	1.10–1.25	1.10–1.25
Gainesville, Texas	.....	.....	.....	.....	.55	.....
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	.....
Roseland, La.	.30	.30	1.00	.80	.80	.80
WESTERN:						
Los Angeles, Calif.	.10– .40	.10– .40	.20– .90	.50– .90	.50– .90	.50– .90
Oregon City, Ore.	All grades range from 1.00 to 1.50 per cu. yd.					
Phoenix, Ariz. (c)	1.25*	1.15*	1.50*	1.15*	1.15*	1.00*
Pueblo, Colo.	.80	.60	.....	1.20	.....	1.15
Seattle, Wash.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*

*Cubic yd. ‡Delivered on job by truck. (a) Per yd., delivered by truck, ¼-in. down, 1.25; 2-in. and less, 2.40. (b) ¼- to ¾-in., 1.25. (c) 60-70% crusher boulders. (d) Plus 15c for winter loading. (e) Prices f.o.b. cars N. P. Ry.

Core and Foundry Sands

Silica sand quoted washed, dried, screened unless otherwise stated; per ton f.o.b. plant.

City or shipping point	Molding, fine	Molding, coarse	Molding brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.75	2.75	2.75	.....	.....	3.75	.....
Cheshire, Mass.	Sand for soap, 7.00–8.00					6.00–8.00	.....
Dresden, Ohio	1.50–1.75	1.25–1.50	1.50	.....	1.50	.....	.....
Eau Claire, Wis.	.....	.....	.....	.....	.....	2.50–3.00	.....
Elco, Ill.	Water floated silica, 92-99½% thru 325 mesh, 18.00–40.00 per ton						
Franklin, Penn.	.....	1.75	.....	1.75	.....	.....	.....
Kasota, Minn.	.....	.....	.....	.....	.....	.....	1.00
Montoursville, Penn.	.....	.....	.....	1.35–1.60	.....	.....	.....
New Lexington, Ohio	1.75–2.00	1.25	.....	.....	.....	.....	.....
Ohlton, Ohio	1.75	1.75	.....	2.00	1.75	1.75	.....
Ottawa, Ill.	1.25–3.25	2.25	1.25–3.25	1.25–3.25	1.25	3.50	3.50
Red Wing, Minn. (a)	.....	.....	.....	.....	1.50	3.00	1.50
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50–5.00†	3.50–5.00†	3.50–5.00†	.....
Silica, Mendota, Va.	Potters' flint, 8.00–14.00						

†Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (a) Filter sand, 3.00.

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio	.....	1.50
Eau Claire, Wis.	4.30	.60–1.00
Franklin, Penn.	.....	1.75
Ohlton, Ohio	1.75	1.75
Ottawa, Ill.	1.25–3.25	1.25
Red Wing, Minn.	.....	1.00
San Francisco, Calif.	3.50	3.50
Silica, Va.	.....	1.75

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. plant.

Cheshire, Mass., in carload lots	5.00–7.00
Franklin, Penn.	2.25
Klondike, Mo.	2.00
Ohlton, Ohio	2.50
Ottawa, Ill.	1.25
Red Wing, Minn.	1.50
San Francisco, Calif.	4.00–5.00
Silica and Mendota, Va.	2.50–3.00

Bank Run Sand and Gravel

Prices given are per ton, f.o.b. producing plant or nearest shipping point.

Algonquin, Ill.¶ (2-in. and less)	.30
Appleton, Minn.†	.55
Brewster, Fla.†	.40
Burnside, Conn.†	.75*
Chicago, Ill.†	.92–1.20
Des Moines, Ia. (sand and gravel mix)	1.00–1.05
Fort Worth, Tex.¶ (2-in. and less)	.60– .75
Gainesville, Tex.¶ (1½-in. and less)	.55
Gary and Miller, Ind.†	1.15–1.40a
Grand Rapids, Mich.¶ (1-in. and less)	.50
Hamilton, Ohio¶ (1½-in. and less)	.50–1.00
Hersey, Mich.¶ (1-in. and less)	.50
Mankato, Minn.†	.70
Seattle, Wash.—Sand, 1/10-in. down, .25*; ¼-in. and less, same; gravel in sizes ranging from 2-in. and less to ½-in. and less	.25*
Winona, Minn.¶ (2-in. and less)	.60
York, Penn. Sand, ¼-in. and less, 1.00; 1/10-in. down	1.10

*Cubic yard. †Fine sand, 1/-10-in. down. (a) Cu. yd., delivered Chicago. ¶Gravel.

Current Price Quotations

ROCK PRODUCTS solicits volunteers to furnish accurate price quotations.

Portland Cement

	Per Bag	Per Bbl.	High Early Strength
Albuquerque, N. M.	.91¼	‡3.15	4.30¶
Atlanta, Ga. (1) (2)	.....	2.11	*3.49¶
Baltimore, Md. (1)	.....	2.65	3.56¶
Berkeley, Calif.	.....	‡2.24	.....
Birm., Ala. (1) (2)	.....	1.75	*3.15¶
Boston, Mass.	.44½	‡1.78–1.88	3.27¶
Buffalo, N. Y. (1)	.48¾	2.45	3.35¶
Butte, Mont.	.90¼	3.61	.....
Cedar Rapids, Ia.	.....	2.04	2.99f
Centerville, Calif.	.....	‡2.24	.....
Charleston, S. C.(2)	.....	2.40b	*3.26¶
Cheyenne, Wyo. (1) (2)	.71½	2.86	.....
Chicago, Ill.	.....	1.85	3.15¶
Cincinnati, Ohio	.....	1.72–1.92	3.22¶
Cleveland, Ohio	.....	1.94	3.24¶
Columbus, Ohio	.....	1.72	3.22¶
Dallas, Texas	.....	‡1.80	3.14¶
Davenport, Iowa	.....	2.04	.....
Dayton, Ohio	.....	1.74	3.24¶
Denver, Colo. (1) (2)	.76¼	3.05	.....
Des Moines, Iowa	.....	2.14	2.99f
Detroit, Mich.	.....	1.95	3.25¶
Duluth, Minn.	.....	1.84	.....
Fresno, Calif.	.....	‡2.43	.....
Houston, Texas	.....	‡1.90	3.38¶
Indianapolis, Ind.	.54¾	1.29–1.69	f2.44-3.19¶
Jackson, Miss.(1)(2)	.....	2.19	*3.59¶
Jacksonville, Fla. (1) (2)	.....	2.36	*3.26¶
Jersey City, N.J.(1)	.....	2.53	3.43¶
Kansas City, Mo. (1) (2)	.45½	2.32	f2.87–2.97¶
Los Angeles, Calif.	.37½	1.50	.....
Louisville, Ky.	.55½	1.72	f2.92–3.31¶
Memphis,T'n.(1)(2)	.....	2.19	f2.74–*3.55¶
Merced, Calif.	.....	‡2.11	.....
Milwaukee, Wis.	.....	2.00	3.30
Minneapolis, Minn.	.....	2.02	.....
Montreal, Que.	.....	1.60	.....
New Orleans, La.	.43	1.72	2.87¶
New York, N.Y.(1)	.43¼	2.43	3.33¶
Norfolk, Va.	.....	1.77	3.27¶
Oklahoma City, Okla.	.57¼	‡2.16	3.31¶
Omaha, Neb. (1)(2)	.54	2.51	3.16¶
Peoria, Ill.	.....	2.02	3.32¶
Pittsburgh, Pa. (1)	.....	2.25	3.35¶
Philadelphia, Pa. (1)	.....	2.55	3.45¶
Phoenix, Ariz.	.....	3.51	.....
Portland, Ore.	.....	2.30	.....
Reno, Nev. (2)	.....	2.82	.....
Richmond, Va. (1)	.....	2.74	3.40¶
Sacramento, Calif.	.....	‡2.35	.....
Salt Lake City, Utah	.70¼	2.81	.....
San Antonio, Texas	.....	.....	3.42¶
San Francisco(1)(2)	.....	2.60	.....
Santa Cruz, Calif.	.....	‡2.20	.....
Savannah, Ga. (2)	.....	2.36a	*3.16¶
St. Louis, Mo.	.48¾	1.50–1.70	f2.65–3.00¶
St. Paul, Minn.	.....	2.02	.....
Seattle, Wash.	.....	‡2.50	f3.70
Tampa, Fla. (1) (2)	.....	2.40	*3.41¶
Toledo, Ohio	.....	1.83–2.03	3.33¶
Topeka, Kan. (1)(2)	.50¼	2.51	3.16¶
Tulsa, Okla. (1) (2)	.53¼	2.53	3.18¶
Wheeling, W.Va. (1)	.....	2.32	3.42
Winston-Salem, N. C.	.....	1.84	3.34¶

Mill prices f.o.b. in carload lots, without bags, to contractors.

Albany, N. Y.	.....	2.15	.....
Bellingham, Wash.	.....	2.35†	.....
Buffington, Ind.	.....	1.60	.....
Chattanooga, Tenn.	.....	2.05	.....
Concrete, Wash.	.....	2.25	.....
Davenport, Calif.	.....	2.05	.....
Hannibal, Mo.	.....	1.90	.....
Hudson, N. Y.	.....	1.75	.....
Leeds, Ala.	.....	1.65	.....
Lime & Oswego, Ore.	.....	2.40	.....
Mildred, Kan.	.....	2.35	.....
Nazareth, Penn.	.....	2.15	.....
Northampton, Penn.	.....	1.75	.....
Richard City, Tenn.	.....	2.05	.....
Steelton, Minn.	.....	1.65	.....
Toledo, Ohio	.....	2.20	.....
Universal, Penn.	.....	1.60	.....

NOTE—Add 40c per bbl. for bags. †10c disc., 10 days. ‡10c disc., 15 days. (a) With bags, 11c refund for paid freight bill. (b) With bags, 15c bbl. refund for paid freight bill. (1) Includes cloth bags at 40c. (2) 10c cash disc., 10c dealer discount. (f) "Velo" cement, including cost of paper bag, 10c disc. 10 days. ¶"Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c disc. 15 days. *Subject 25c bbl. dealer discount.

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chazy, N. Y.	.....	1.60	.....	.....	.....	.....
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Farmington, Conn.	.....	1.30	1.10	1.00	1.00	.....
Ft. Spring, W. Va.	.35	1.35	1.35	1.35	1.25	1.15
Munns, N. Y.	.75	1.15	1.15	1.00	1.00	.....
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
Shaw's Junction, Penn. (e)	.85	1.35–1.60	1.35	1.35	1.35	1.35
Syracuse, N. Y.	.50	1.00	1.00	1.00	1.00	1.00
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Alton, Ill.	1.85	.....	1.85	.....	.....	.....
Davenport, Iowa	1.00	1.50	1.50	1.30	1.30	1.30
Dubuque, Iowa	.95	.95	.95	.95	.95	.95
Stolle and Falling Springs, Ill.	1.05–1.70	.95–1.70	1.15–1.70	1.05 1.70	1.05–1.70	.....
Greencastle, Ind.	1.25	1.10	1.10	1.10	1.00	1.00
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
McCook, Ill.	.90	1.00	1.00	1.00	1.00	1.00
Montreal, Canada	.75–1.00	1.65–1.85	1.45	1.15	1.05	.95
Sheboygan, Wis.	1.20	1.20	1.20	1.20	.....	.....
Stone City, Iowa	.75	.....	1.10	1.05	1.10	.....
Toronto, Canada	2.50	2.50	2.50	2.50	2.50	2.50
Waukesha, Wis.	.....	.90	.....	.90	.90	.....
Wisconsin points	.50	.....	.100	.90	.90	.....
Youngstown, Ohio	1.00	1.00	1.25	1.25	1.25	1.25
SOUTHERN:						
Cartersville, Ga.	1.00	1.65	1.65	1.35	1.15	1.15
Chico and Bridgeport, Texas	1.00–1.35	1.10–1.30	1.10–1.25	1.25	1.00–1.20	1.00
Cutler, Fla.	.....	.....	1.75r	1.75r	.....	.....
El Paso, Texas	.50– .75r	1.00–1.25	1.00–1.25	1.00	1.00	1.00
Olive Hill, Ky.	1.00	1.00	1.00	.90	.90	.90
Rocky Point, Va.	.50– .75	1.40–1.60	1.30–1.40	1.15–1.25	1.10–1.20	1.00–1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.70
Blue Springs and Wymore, Neb. (t)	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.10	1.25	1.25	1.25	1.00	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
Rock Hill, St. Louis, Mo.	1.45	1.45	1.45	1.45	1.45	1.45
Stringtown, Okla.	1.00–1.35	1.10–1.30	1.10–1.25	1.25	1.00–1.20	1.00

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	1.20	1.60	1.45	1.35	.....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Chico, Texas	2.50	2.00	1.45	1.20	1.15	.....
Duluth, Minn.	.90–1.25	2.25–2.75	1.55	1.55	1.55	1.25
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Texas	2.50	2.00	1.45	1.25	1.20	1.15
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	.....
Northern New Jersey	1.35	2.10	1.90	1.50	1.50	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
Toronto, Canada	4.70	5.80	.....	4.05	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Cayce, S. C.—Granite	.....	.....	1.75	1.75	1.60	.....
Chicago, Ill.—Granite	2.00	1.70	.....	1.50	1.50	.....
Eastern Pennsylvania—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Pennsylvania—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	.....	.....	2.25–2.50s	.....	.....	.....
Lithonia, Ga.—Granite	.50	1.75b	1.60	1.35	1.25	.....
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.	3.00–3.50	.....	2.00–2.25	2.00–2.25	.....	1.25–3.00
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Toccoa, Ga.—Granite	.50	1.50	1.50	1.25	1.25	1.20

(a) Limestone, ¼ to ½ in., 1.35 per ton; Lime flour, 8.50 per ton. (b) To ½ in. (c) 1 in., 1.40. (d) 2-in., 1.30. (e) Price net after 10c cash discount deducted. (n) Ballast R.R., .90; run of crusher, 1.00. (q) Cusher run, 1.40; ¼-in. granlithic finish, 3.00. (r) Cubic yard. (s) 1-in. and less, per cubic yard. (t) Rip rap, 1.20–1.40 per ton.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Allentown, Penn.	1.00–1.50	.40– .60	.80–1.00	.50– .80	.50– .80	.60– .80	.80
Bethlehem, Penn.	1.25–1.75	.60– .70	.60–1.00	.60– .75	.60– .80	.70– .90	.....
Buffalo, N. Y., Erie and Du Bois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Pennsylvania	2.00–2.50	.90–1.20	1.00–1.50	1.00–1.20	1.00–1.20	1.00–1.20	1.00–1.20
Northern New Jersey	2.00–2.50	.90–1.20	1.00–1.50	1.00–1.20	1.00–1.20	1.00–1.20	1.00–1.20
Reading, Penn.	2.00	1.00	.....	1.00	.....	.....	.....
Swedeland, Penn.	1.75–2.50	.60– .80	1.00–1.25	.80–1.25	.80–1.25	1.10–1.25	1.10–1.25
Western Pennsylvania	2.00–2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.30*	1.80*	1.45*	1.45*	1.45*	.....
Jackson, Ohio	2.05*	1.05*	1.80*	1.30*	1.05*	1.30*	.....
Toledo, Ohio	1.50	1.10	1.25	1.25	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.	2.05*	1.45*	1.80*	1.45*	1.45*	1.45*	.....
Ensley and Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.90
Longdale, Va.	2.50	.75	.....	1.25	1.25	1.15	1.05
Woodward, Ala.†	2.05	.55*	.....	1.15*	.90*	.90*	.....

5c per ton discount on terms. †1¼ in. to ¼ in., $1.05; ⅛ in. to 10 mesh. $1.25*; ⅛ in. to 0 in., 90*; ¼ in. to 10 mesh. .80*.

Agricultural Limestone
(Pulverized)

Alton, Ill.—Analysis, 99% $CaCO_3$; .03% $MgCO_3$; 90% thru 100 mesh 4.00
Belfast, Me.—Analysis, $CaCO_3$, 90.4%; $MgCO_3$, trace, per ton 7.00
Branchton, Penn.—50% thru 100 mesh, in sacks, $5.00; bulk 3.50
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh 1.50
Cartersville, Ga.—90% thru 100 mesh, 2.00; 50% thru 50 mesh 1.50
Davenport, Iowa—Analysis, 92-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, per ton 6.00
Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 90% thru 100 mesh 3.50
Knoxville, Tenn.—Analysis, 52% $CaCO_3$; 36% $MgCO_3$; 80% thru 100 mesh, bags, 3.75; bulk 2.50
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton 2.00
Marlbrook, Va.—(Lime marl)—Analysis, $CaCO_3$, 90%; 90% thru 100 mesh, in bags, 3.50–4.00; bulk 2.00–2.25
Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh 4.25
Sibley, Mich.—Analysis, 87.47% $CaCO_3$; 8.30% $MgCO_3$; 60% thru 100 mesh, bulk, per ton, 2.30; 100-lb. paper bags, f.o.b. Sibley, Mich., per ton 3.75

Agricultural Limestone
(Crushed)

Atlas, Ky.—Analysis, $CaCO_3$, 94-98%; $MgCO_3$, trace; 50% thru 4 mesh 1.00
Bedford, Ind.—Analysis, 98½% $CaCO_3$; ½% $MgCO_3$; 90% thru 10 mesh 1.50
Chico and Bridgeport, Tex.—Analysis, 95% $CaCO_3$; 1.3% $MgCO_3$; 90% thru 4 mesh 1.00
Charles-Town, W. Va.—Lime Marl—Analysis, 95% $CaCO_3$, 50% thru 100 mesh, bulk, 3.00; including burlap bags 4.50
Colton, Calif.—100% thru 14 mesh, bulk 3.50
Davenport, Iowa—Analysis, 92-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 4 mesh, 50% thru 20 mesh; bulk, per ton 1.10
Dubuque, Ia.—Analysis, 34.96% $CaCO_3$; 59.62% $MgCO_3$; 90% thru 4 mesh ..... .95
Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh 1.00
Fort Spring, W. Va.—Analysis, 90% $CaCO_3$; 3% $MgCO_3$; 50% thru 100 mesh 1.50
Hillsville, Penn.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$; 75% thru 100 mesh, sacked 5.00
Jamesville, N. Y.—Analysis, 90% $CaCO_3$; 5% $MgCO_3$; 90% thru 100 mesh; in sacks, 4.60; bulk 3.35
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh 2.00
Screenings (¼ in. to dust) 1.00
Marblehead, Ohio—90% thru 100 mesh 3.00
90% thru 50 mesh 2.00
90% thru 4 mesh 1.00
McCook and Gary, Ill.—Analysis, 60% $CaCO_3$, 40% $MgCO_3$; 90% thru 4 mesh ..... .90
Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Kokomo, Ind.—85% thru 10 mesh, 25% thru 100 mesh 1.50
Rocky Point, Va.—50% thru 200 mesh, bulk, in carloads, 2.00; 100-lb. paper bags, 3.25; 200-lb. burlap bags 3.50
Stolle and Falling Springs, Ill.—Analysis, 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh 1.15–1.70
Stone City, Iowa—Analysis, 98% $CaCO_3$; 50% thru 50 mesh ..... .75
West Stockbridge, Mass.*—Analysis, 95% $CaCO_3$; 90% thru 100 mesh, bulk 100-lb. paper bags, 4.75; cloth 3.50 5.25
Waukesha, Wis.—90% thru 100 mesh, 4.00; 50% thru 100 mesh 2.10
*Less 25c cash 15 days.

Pulverized Limestone for Coal Operators

Davenport, Iowa—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, ton 6.00
Hillsville, Penn., sacks, 5.10; bulk 3.50
Joliet, Ill.—Analysis, 50% $CaCO_3$; 42% $MgCO_3$; 98% thru 100 mesh; 90% thru 200 mesh (bags extra) 3.50
bulk 4.00
Rocky Point, Va.—Analysis, 97% $CaCO_3$; 75% $MgCO_3$; 85% thru 200 mesh, bulk 2.25–3.50
Waukesha, Wis.—90% thru 100 mesh, bulk 4.00

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.	.....	.....	12.00	.....	.....	17.50	.....	2.00
Buffalo, N. Y.	.....	.....	.....	12.00	.....	.....	.....	.....
Knickerbocker, Devault, Cedar Hollow and Rambo, Penn.	.....	9.50	9.50	9.50	.....	9.50	8.50	.....
Lime Ridge, Penn.	9.00	9.00	9.00	.....	7.00	.....	5.00	.....
CENTRAL:								
Afton, Mich.	.....	.....	.....	.....	.....	10.75	7.50	12.11
Carey, Ohio	9.50	6.50	6.50	.....	8.00	.....	8.00	1.50
Cold Springs, Ohio	.....	6.50	6.50	.....	.....	.....	7.00	.....
Gibsonburg, Ohio	9.50	.....	.....	.....	7.00	9.00	7.00	.....
Huntington, Ind.	.....	6.50	6.50	.....	.....	.....	.....	.....
Little Rock, Ark.	.....	14.40	.....	15.40	.....	.....	11.90	1.79
Marblehead, Ohio	.....	6.50	6.50	.....	.....	.....	7.00	1.50[3]
Milltown, Ind.	.....	7.50– 8.50	.....	8.25– 9.25	7.00[5]	9.25[6]	6.50[7]	1.40[8]
Scioto, Ohio	.....	7.00	7.00	8.00	8.00	.62½	7.00	1.50
Sheboygan, Wis.	.....	10.50	10.50	10.50	.....	.....	9.50	2.00[4]
Tiffin, Ohio	.....	.....	.....	.....	8.00	10.00	.....	.....
Wisconsin points	.....	11.50	.....	.....	.....	.....	9.50	.....
Woodville, Ohio[26]	9.50	6.50	6.50	10.50[24]	7.00	9.00[9]	8.00	1.40[3]
SOUTHERN:								
Keystone, Ala.	17.00	9.00	9.00	8.00–12.00	.....	.....	6.00[21]	1.35
Knoxville, Tenn.	.....	9.00	9.00	7.50– 9.00	6.00	1.35[10]	6.00	1.50
Ocala, Fla.	.....	11.00	.....	.....	.....	.....	11.00[11]	.....
Pine Hill, Ky.	.....	9.00	7.50	7.50	.....	.....	5.00[1]	1.25[2]
WESTERN:								
Kirtland, N. M.	.....	.....	.....	.....	.....	.....	15.00	.....
Los Angeles, Calif.	.....	.....	.....	.....	.....	.....	12.00	.....
San Francisco, Calif.	19.00	14.00–17.00	12.50	14.00–19.00	14.50[20]	.90[17]	11.00[19]	1.85[17]

[1]Also 6.00. [2]To 1.35. [3]Wooden, steel, 1.60. [4]Steel. [5]To 7.50. [6]To 9.75. [7]To 7.00. [8]To 1.50 in steel drums; 1.25 and 1.35 in waterproof bags. [9]80-lb. [10]Per bbl. [11]To 14.00. [17]Less credit for return of empties. [19]To 14.50. [20]Also 13.00. [21]To 8.00. [24]Superfine, 92.25% thru 200 mesh. [26]General purpose hydrated lime in 10-lb. paper sacks, 12.50 per ton.

Wholesale Prices of Slate

Prices given are f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened, 100% thru 200 mesh, 6.00 per ton in paper bags; 94% thru 300 mesh, 6.00 per ton in paper bags.

Slate Granules

Esmont, Va.—Blue, $7.50 per ton. Granville, N. Y.—Red, green and black, $7.50 per ton.
Pen Argyl, Penn.—Blue-grey, 6.50 per ton in 150-lb. paper bags (plus 10c per bag).

Roofing Slate

Prices per square—Standard thickness.

City or shipping point:	3/16-in.	¼-in.	⅜-in.	½-in.	¾-in.	1-in.
Arvonia, Va.—Buckingham oxford grey	13.88	19.44	24.99	29.44	34.44	45.55
Bangor, Penn.—No. 1 clear	10.50–14.50	24.50	29.00	33.50	44.50	55.60
No. 1 ribbon	9.00–10.25	20.00	24.50	29.00	40.00	51.25
Gen. Bangor No. 2 ribbon	6.75– 7.25	.....	.....	.....	.....	.....
Gen. Bangor mediums	9.50–11.25	.....	.....	.....	.....	.....
No. 1 Albion clear	9.00–10.50	16.00	23.00	27.00	37.00	46.00
Chapman Quarries, Penn.—No. 1	8.50–11.25	(Vari-tone, 12.00–13.00)				
Medium	7.75– 9.00	.....	.....	.....	.....	.....
Hard vein	.....	16.00	23.00	26.00	32.00	40.00
Granville, N. Y.—Sea green, weathering	14.00	24.00	30.00	36.00	48.00	60.00
Semi-weathering, green and gray	15.40	24.00	30.00	36.00	48.00	60.00
Mottled purple and unfading green	21.00	24.00	30.00	36.00	48.00	60.00
Red	27.50	33.50	40.00	47.50	62.50	77.50
Monson, Maine	19.80	24.00	.....	.....	.....	.....
Pen Argyl, Penn.*						
Graduated slate (blue)	.....	16.00	23.00	27.00	37.00	46.00
Graduated slate (grey)	.....	18.00	25.00	29.00	39.00	48.00
Color-tone	11.50–12.50; Vari-tone, 12.00–13.00; Cathedral gray, 14.00–15.00					
No. 1 clear (smooth text)	7.25–10.50; No. 1 clear (rough text), 8.25–9.50					
Albion-Bangor medium	8.00–9.00; No. 2 clear, 8.00–9.00; No. 1 ribbon, 8.00–8.50					
Slatedale and Slatington, Penn.—						
Genuine Franklin	11.25	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1	10.50	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1 clear	9.50	18.00	22.00	26.00	36.00	46.00
Blue Mountain No. 2 clear	8.00	18.00	22.00	26.00	36.00	46.00

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.
(b) Prices other than 3/16-in. thickness include nail holes.
(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.
*Unfading grey, 14.00–15.00; 10% disc. to roofer; 10%–8⅓% to wholesaler.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:
- Crude talc, per ton 5.00
- Ground talc (20-50 mesh), bags 6.50
- Ground talc (150-200 mesh), bags 9.00
- Pencils and steel crayons, gross 1.50– 2.00

Chester, Vt.—Finely ground talc (carloads), Grade A—99-99¾% thru 200 mesh, 8.00–8.50; Grade B, 97-98% thru 200 mesh, 7.50–8.00, 1.00 per ton extra for 50-lb. paper bags; 166⅔-lb. burlap bags, 15c each; 200-lb. burlap bags, 18c each. Credit for return of bags. Terms 1%, 10 days.

Clifton, Va.:
- Crude talc, per ton 4.00
- Ground talc (150-200 mesh), in bags 12.00

Conowingo, Md.:
- Crude talc, bulk 4.00
- Ground talc (150-200 mesh), in bags 14.00
- Cubes, blanks, per lb. ..... .10

Emeryville, N. Y.:
- Ground talc (200 mesh), bags 13.75
- Ground talc (325 mesh), bags 14.75

Hailesboro, N. Y.:
- Ground talc (300-350 mesh) in 200-lb. bags 15.50–20.00

Henry, Va.:
- Crude (mine run) 3.50– 4.00
- Ground talc (150-200 mesh), bags 6.25–10.50

Joliet, Ill.:
- Ground talc (200 mesh) in bags:
- California white 30.00
- Southern white 20.00
- Illinois talc 10.00
- Crude talc 3.75

Los Angeles, Calif.:
- Ground talc (150-200 mesh) in bags 16.00–25.00

Natural Bridge, N. Y.:
- Ground talc (300-325 mesh), bags 12.00–15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

- Gordonsburg, Tenn.—B.P.L. 65-68% 3.75– 4.25
- Mt. Pleasant, Tenn.—B.P.L., 75% 6.50
- Run of plant fines, 72% B.P.L., per ton of 2000 lb. 5.00

Ground Rock

(2000 lb.)

- Gordonsburg, Tenn.—B.P.L. 65–70% 3.75– 4.25
- Mt. Pleasant, Tenn.—Lime phosphate: B.P.L., 72½% 11.20
- Mt. Pleasant, Tenn.—B.P.L., 72% 5.00– 5.50

Florida Phosphate

(Raw Land Pebble)

(Per Ton)

Florida—F.o.b. mines, gross ton, 68/66%
- B.P.L., Basis 68% 3.25
- 70% min. B.P.L., Basis 70% 3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

- Pringle, S. D.—Mine run, per ton 100.00–125.00
- Punch mica, per lb. ..... .06
- Scrap, per ton, carloads 20.00

Rumney Depot, N. H.—Per ton,
- Mine run 300.00–360.00
- Clean shop scrap 27.50–29.00
- Mine scrap 22.50
- Roofing mica a37.50–40.00
- Punch mica, per ton 200.00–240.00
- Trimmed mica, per ton, 40 mesh, 42.50–45.00; 100 mesh, 60.00; 200 mesh 100.00

Trenton, N. J.—Mine scrap, per ton 20.00
Clean shop scrap, per ton 22.00

(a) Also 38.00–42.50 per ton.

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x 36". Per M Sq. Ft.	—Plaster Board— ⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
Acme, Tex.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Blue Rapids, Kan.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Centerville, Iowa	.....	.....	6.00	7.00	.....	7.50	8.00	10.50a	.....	.....	.....	.....	.....
East St. Louis, Ill.—Special Gypsum Products—Partition section, 4 in. thick, 12 in. wide, and up to 10 ft. 3 in. long, 12c per ft., 21.00 per ton; outside wall section and interior bearing wall section, 6 in. wide, 6 in. thick, and up to 10 ft. 3 in. long, 25c per ft., 30.00 per ton; floor section, 7 in. thick, 16 in. wide, and up to 13 ft. 3 in. long, 17c per ft., 23.00 per ton.													
Ft. Dodge, Iowa; N. Holston, Va.; Akron, N. Y.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Grand Rapids, Mich.	.....	.....	7.00d	.....	8.00d	8.00d	19.85c	8.00d	29.25e	21.00d	.....	15.00	22.50
Los Angeles, Calif. (b)	.....	.....	7.00–9.50	7.00–9.50	10.00-12.00	.....	10.00–12.00	.....	.....	.....	.....	.....	.....
Medicine Lodge, Kan.	1.45	.....	.....	.....	.....	.....	11.50d	.....	15.00y	.....	.....	.....	.....
Portland, Colo.	.....	7.00	7.00	9.00	9.00	9.50	9.00	.....	27.50	.....	22.50	27.50	.....
Providence, R. I. (x)	.....	.....	.....	12.00–13.00e	.....	.....	.....	.....	.....	.....	.....	.....	.....
Seattle, Wash. (z)	6.00	9.00	9.00	13.00	.....	.....	14.00	.....	.....	.....	.....	.....	.....
Winnipeg, Man.	5.00	.....	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00w	25.00g	33.00f

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (a) White molding. (b) Plasterboard, ⅜-in., 16c-17c sq. yd. (c) Satin Spar, in paper bags. (d) Includes paper bags. (e) Includes jute sacks. (f) "Gyproc," ⅜ in. by 48 in. by 5 and 10 ft. long. (g) ⅜ in. by 48 in. by 3 to 4 ft. (w) 16x48. (x) "Fabricaste" gypsum blocks, 2- and 3-in., f.o.b. motor trucks at plants, 7¼c-8¼c. Block setting plaster, per ton, in jute sacks, 12.00. (y) Jute sacks, 18.00; paper sacks, 16.00. (z) Gypsum partition tile, 3-in., 9c per sq. ft.; 4-in., 11c per sq. ft.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, cream and coral pink	¶12.50–¶14.50	¶12.50–¶14.50
Cranberry Creek, N. Y.—Bio-Spar, per ton in bags in carload lots, 9.00; less than carload lots, 12.00 per ton in bags; bulk, per ton		7.50
Crown Point, N. Y.—Mica Spar		¶9.00–¶12.00
Davenport, Iowa — White limestone, in bags, per ton	¶6.00	¶6.00
Easton, Penn.—Royal green	16.00–20.00a	
Harrisonburg, Va.	11.00–14.50	
Middlebrook, Mo.—Red		20.00–25.00
Middlebury, Vt. — Middlebury white		¶9.00–a10.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags		c5.50
Phillipsburg, N. J.—Royal green granite		15.00–18.00
Randville, Mich.—Crystalite white marble, bulk	4.00	4.00– 7.00
Stockton, Calif.—"Nat-rock" roofing grits		12.00–40.00
Tuckahoe, N. Y.—Tuckahoe white	8.00	
Warren, N. H.		8.00–15.00

¶C.L. ‖L.C.L. (a) Including bags. (b) In burlap bags, 2.00 per ton extra. *Per 100 lb. (c) Per ton f.o.b. quarry in carloads; 7.00 per ton L.C.L.

Soda Feldspar

DeKalb Jct., N. Y.—Color, white; pulverized, 200 mesh, in bags, per ton, 20.00, bulk 18.00; 140 mesh, in bags, ton, 18.00; bulk 16.00

Potash Feldspar

Auburn and Topsham, Me.—Color white, 98% thru 140 mesh (bulk) 19.00

Bedford Hills, N. Y.—Color, white; analysis, K_2O, 12.26%; Na_2O, 2.86%; SiO_2, 66.05%; Fe_2O_3, .08%; Al_2O_3, 18.89%; pulverized 78% thru 100 mesh, bulk, 11.00–14.00; crude, bulk, per ton 9.00

Coatesville, Penn.—Color, white; analysis, K_2O, 12.30%; Na_2O, 2.86% SiO_2, 66.05%; Fe_2O_3, .08%; Al_2O_3, 18.89%; crude, per ton 8.00

Trenton, N. J.—White; analysis, K_2O, 13-14%; Na_2O, 2-2½%; SiO_2, 64-65%; Fe_2O_3, 0.07%; Al_2O_3, 18.50-19.25%; pulverized, 97% thru 325 mesh, crude, 8.50 per ton, ground 21.00

Rumney and Cardigan, N. H.—Color, white; analysis, K_2O, 9-12%; Na_2O, trace; SiO_2, 64-67%; Al_2O_3, 17-18%, crude, bulk 7.00– 7.50

Rumney Depot, N. H.—Color, white; analysis, K_2O, 8-13%; Na_2O, 1-1½%; SiO_2, 62-68%; Al_2O_3, 17-18%, crude, bulk 7.00– 7.50

Penland, N. C.—White; crude, bulk 8.00
Ground, bulk 16.50

Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; pulverized, bulk 18.00
(Bags 15c extra.)

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .12½; 12-in., .17½; 15-in., .35; 18-in., .50; 20-in., .60; 24-in., 1.00; 30-in., 1.35; 36-in. 2.00

Longview, Wash.—Drain tile, per 100 ft.

3-in.	5.00
4-in.	6.00
6-in.	10.00

Tacoma, Wash.—Drain tile, per 100 ft.

3-in.	4.00
4-in.	5.00
6-in.	7.50
8-in.	10.00

Chicken Grits

Centerville, Iowa	9.25
Belfast, Me.—(Agstone), per ton, in carloads	10.00
Chico, Tex.—Hen size and Baby Chick, packed in 100-lb. sacks, per ton	8.50–10.00
Coatesville, Penn.—(Feldspar), per ton, in bags of 100 lb. each	8.00
Cranberry Creek, N. Y.—Per ton, in carload lots; in bags, 9.00; bulk, 7.50. Less than carload lots, in bags	12.00
Davenport, Iowa — High calcium carbonate limestone, in bags L.C.L., per ton	6.00
El Paso, Texas—(Limestone) per 100-lb. sack	.75
Los Angeles, Calif.—Per ton, including sacks: Gypsum	7.50– 9.50
Middlebury, Vt.—Per ton (a)	10.00
Randville, Mich.—(Marble), bulk	6.00
Seattle, Wash.—(Gypsum), bulk, ton	10.00
Warren, N. H.	8.50– 9.50
Waukesha, Wis.—(Limestone), per ton	7.00
West Stockbridge, Mass.	¶7.50–¶9.00
Wisconsin Points—(Limestone), per ton	15.00

(a) F.o.b. Middlebury, Vt. ¶C.L. ‖L.C.L.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	10.50
Dayton, Ohio	12.50–13.50
Detroit, Mich. (d)	e13.00–16.00*b
Farmington, Conn.	16.00
Grand Rapids, Mich.*	14.00–15.00
Jackson, Mich.	13.00
Madison, Wis.	12.50a
Mishawaka, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00*
New Brighton, Minn.	8.00
Pontiac, Mich.	13.50
Portage, Wis.	15.00
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas	12.50
Sebewaing, Mich.	12.50
South St. Paul, Minn.	9.00
Syracuse, N. Y.	18.00–20.00
Toronto, Canada (f)	g12.50–15.00c
Winnipeg, Canada	15.00

Delivered on job. (a) Less 50c disc. per M 10th of month. (b) 5% disc., 10th of month. (c) Delivered in city. (d) Also 15.50. (e) Also 14.00. (f) Also 11.00. (g) F.o.b. yard.

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

City or shipping point	Size 8x8x16
Camden, N. J.	16.50
Chicago District	180.00–210.00a
8x10x16	230.00–260.00a
8x12x16	280.00–330.00a
Columbus, Ohio	13.00b– 15.00†
Forest Park, Ill.	21.00*
Grand Rapids, Mich.	11.00*
Graettinger, Iowa	.18– .20
Indianapolis, Ind.	.10– .12a
Los Angeles, Calif.:	
4x8x12	4.50*
4x6x12	3.90*
4x4x12	2.90*

*Price per 100 at plant.
†Rock or panel face.
(a) Face. (b) Plain.

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.:	
Red	15.00
Green	18.00
Cicero, Ill.—French and Spanish tile (red, orange, choc., yellow, tan, slate, gray) per sq., 9.50–10.00; green or blue, per sq.	11.50–12.00
Detroit, Mich.—5x8x12, per M	67.50
Houston, Texas—Roofing Tile, per sq.	25.00

Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00

Cement Building Tile

Camden and Trenton, N. J.:	
3x8x16, per 100, 9.00; 3x9x16, per 100	9.00
4x8x16, per 100, 12.00; 4x9x16, per 100	13.00
6x8x16, per 100, 16.50; 6x9x16, per 100	15.50
Chicago District (Haydite):	
4x 8x16, per 100	13.00
8x 8x16, per 100	20.00
8x12x16, per 100	28.00
Columbus, Ohio:	
5x8x12, per 100	6.00
Grand Rapids, Mich.:	
5x8x12, per 100	6.00
Houston, Texas:	
5x8x12 (Lightweight), per M	80.00
Longview, Wash.:	
4x6x12, per 1000	55.00
4x8x12, per 1000	64.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Camden & Trenton, N. J.	17.00	
Chicago District "Haydite"	14.00	
Columbus, Ohio	16.00	17.00
Ensley, Ala. ("Slagtex")	13.00a	
Forest Park, Ill.		37.00
Longview, Wash.	16.50	20.00– 40.00
Milwaukee, Wis.	14.00	31.50
Omaha, Neb.	17.00	30.00– 40.00
Philadelphia, Penn.	15.50	
Portland, Ore.	12.00	22.50– 55.00
Prairie du Chien, Wis.	14.00	22.00– 25.00
Rapid City, S. D.	18.00	30.00– 40.00

(a) Delivered on job; 10.00 f.o.b. plant.

Fullers Earth

Prices per ton in carloads, f.o.b. Florida shipping points.

16– 30 mesh	20.00
30– 60 mesh	22.00
60–100 mesh	18.00
100 mesh and finer	9.00

Note—Bags extra and returnable for full credit.

Stone-Tile Hollow Brick

Prices are net per thousand f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*†	40.00	60.00	70.00
Asheville, N. C.	35.00	50.00	60.00
Atlanta, Ga.	29.00	42.50	53.00
Brownsville, Tex.		53.00	62.50
Brunswick, Me.†	40.00	60.00	80.00
Charlotte, N. C.	35.00	45.00	60.00
De Land, Fla.	30.00	50.00	60.00
Farmingdale, N. Y.	37.50	50.00	60.00
Houston, Tex.	35.00	45.00	60.00
Jackson, Miss.	45.00	55.00	65.00
Klamath Falls, Ore.	65.00	75.00	85.00
Longview, Wash.		55.00	64.00
Los Angeles, Calif.	29.00	39.00	45.00
Mattituck, N. Y.	45.00	55.00	65.00
Medford, Ore.	50.00	55.00	70.00
Memphis, Tenn.	50.00	55.00	65.00
Mineola, N. Y.	45.00	50.00	60.00
Nashville, Tenn.	30.00	49.00	57.00
New Orleans, La.	35.00	45.00	60.00
Norfolk, Va.	35.00	50.00	65.00
Passaic, N. J.	35.00	50.00	65.00
Patchogue, N. Y.		60.00	70.00
Pawtucket, R. I.	35.00	55.00	75.00
Safford, Ariz.	32.50	48.75	65.00
Salem, Mass.	40.00	60.00	75.00
San Antonio, Tex.	37.00	46.00	60.00
San Diego, Calif.	35.00	44.00	52.50

Prices are for standard sizes—No. 4, size 3½x4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size 3½x8x12 in. *Delivered on job. †10% disc.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8-in.	10 in.	12 in.	15-in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Grand Rapids, Mich.(b)	.....	.....	.....	.60	.70	.90	1.20	.....	.....	1.80	2.10	2.35	3.50	4.00	5.60	6.90	7.85
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	1.70†	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.75	.85	.90	1.15	.....	.....	1.60	.....	2.50	.....	.....	.....	.....	.....
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Tiskilwa, Ill. (rein.)	.....	.....	.....	.75	.85	.95	1.20	1.60	.....	2.00	.....	2.75	3.40	.....	6.50	.....	10.00
Tacoma, Wash.	.15	.18	.22½	.30	.40	.55	.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	.85½	.....	1.14	.....	.....	1.81	.....	2.47	3.42	4.13	5.63	6.49	7.31

(a) 24-in. lengths. (b) Reinforced. †21-in. diameter.

Empire State Sand and Gravel Producers Meet

THE annual convention of the Empire State Sand and Gravel Producers' Association was held at the Hotel Sagamore, Rochester, N. Y., December 12, 1929. Luncheon was followed by a get-together meeting and a general discussion and exchange of experiences. Later in the afternoon, at the business session, the officers for the ensuing year were elected.

C. W. Maxwell, of the Albany Gravel Co., was chosen president; H. A. Stelley, of the Buffalo Gravel Corp., vice-president; and John G. Carpenter of the Madison Sand and Gravel Corp., was re-elected secretary and treasurer.

Following the election of officers, adjournment was taken until some time in March, the date to be announced later.

The dinner at the Rochester Club was featured by talks made by Col. Wm. M. Acheson, state engineer, and by Frank P. McKibben, consulting engineer to the city of Rochester, on their new bridges.

Col. Acheson predicted a larger year in 1930, with a $62,000,000 highway program on, and the various railroad and building projects, and urged organized concerted action and adherence to specifications.

Mr. McKibben gave a brief but very interesting historical outline of the development of bridges.

The following producers, members, associate members and guests attended the convention:

Registration—Producer Members

Albany Gravel Co., Albany, N. Y.—C. W. Maxwell, G. K. Smith.

Buffalo Gravel Corp., Buffalo, N. Y.—H. A. Stelley.

Buffalo Slag Co., Buffalo, N. Y.—John Franz, H. W. Vickery, C. W. Wicker.

Consolidated Materials Co., Rochester, N. Y.—B. C. Brotch, Henry F. Marsh.

Dolomite Products Co., Rochester, N. Y.—John H. Odenbach.

Eldridge and Robinson, Auburn, N. Y.—J. W. Robinson.

General Crushed Stone Co., Rochester, N. Y.—George E. Schaefer.

Madison Sand and Gravel Corp., Hamilton, N. Y.—John G. Carpenter, G. C. Carpenter.

Nathan Oaks Sons, Oaks Corners, N. Y.—C. V. Oaks, Nathan Oaks.

Rib Stone Concrete Corp., Le Roy, N. Y.—Howard Bell.

State Line Sand and Gravel Co., Scranton, Penn.—O. C. Peck.

Valley Sand and Gravel Corp., Rochester, N. Y.—W. A. Flynn, B. G. Lucas, R. W. Storey, John Taylor.

Whitmore, Rauber and Vicinius, Rochester, N. Y.—H. W. Butler, John E. Rauber.

Guests and Associate Members

William M. Acheson, chief engineer, State Highway Department, Albany, N. Y.; C. A. Adams, sand and gravel plant equipment, Rotterdam Jct., N. Y.; C. J. Campbell, city engineer's office, Rochester, N. Y.; G. L. Crofte, Rochester Gas and Electric Corp., Rochester, N. Y.; A. E. Fielding, Niagara Concrete Mixer Co., Buffalo, N. Y.; B. G. Fisher, New Jersey Wire Cloth Co., New York, N. Y.; Max Greenberg, city engineer's office, Rochester, N. Y.; E. C. Harsh, ROCK PRODUCTS, Chicago, Ill.; William Henderson, New Jersey Wire Cloth Co., Rochester, N. Y.; Henry L. Howe, State Department of Public Works, Rochester, N. Y.; James E. Kelley, State Department of Public Works, Rochester, N. Y.; John P. Larsen, State Department of Public Works, Rochester, N. Y.; Frank P. McKibben, consulting engineer, Black Gap, Penn.; Oscar Marth, State Department of Public Works, Rochester, N. Y.; H. J. Michael, State Department of Public Works, Rochester, N. Y.; V. J. Milkowski, Morris Machine Works, Baldwinsville, N. Y.; George G. Miller, State Department of Public Works, Rochester, N. Y.; W. S. Nicol, Cross Engineering Co., Carbondale, Penn.; E. L. Oliver, city engineer's office, Rochester, N. Y.; E. T. Pope, city engineer's office, Rochester, N. Y.; E. F. Ruchenberger, city engineer's office, Rochester, N. Y.; Glen Searls, State Department of Public Works, Rochester, N. Y.; W. E. Trauffer, *Pit and Quarry*, Chicago, Ill.; F. M. Welch, Welch Engineering Service, Greenville, Ohio; S. K. Yarrington, Hendrick Manufacturing Co., Carbondale, Penn.

To Build New Cement Mill at Sonora, Mexico

ERECTION of a new 500-bbl. per day wet-process cement mill at Hermosillo, capital city of Sonora, Mexico, is planned, according to a report in the *Tucson* (Ariz.) *News*. The new project, to cost about $500,000, is being promoted by Ygnacio Soto and is said to have the support of Gov. Francisco Elias. Deposits in the Hermosillo area are said to have been reported as quite satisfactory by the Smith-Emery Co. of Los Angeles.

Construction will start by January 1, 1930, and the plant is expected to be ready for operation in August of that year, the report states.

Retail Prices of Various Rock Products Materials

THE TABLE below gives average prices paid November 1, 1929, by contractors for various rock products, delivered on the job at different principal cities of the United States. These prices were secured through the Bureau of Census.

AVERAGE RETAIL PRICES FOR ROCK PRODUCTS MATERIALS, NOVEMBER 1, 1929

City	MATERIAL					
	Portland cement, per bbl., excl. of cont.	Gypsum wallboard, ⅜-in., per M	Hydrated lime, per ton	Building sand, per cu. yd.	Crushed stone, ¾-in., per ton	Gypsum plaster, neat, per ton
New Haven, Conn.	$2.80	.....	$20.00	$1.50	$2.25	.....
Waterbury, Conn.	3.00	30.00	20.00	1.35	2.45	$20.00
New London, Conn.	3.00	25.00	26.00	1.50	3.00	18.00
New Bedford, Mass.	2.80	25.00	18.00	1.75	3.00	18.50
Haverhill, Mass.	2.80	27.50	20.00	.....	.....	16.50
Poughkeepsie, N. Y.	2.28	22.00	24.00	2.50	3.50	18.00
Albany, N. Y.	2.97	24.75	18.00	.....	.....	15.30
Rochester, N. Y.	2.70	20.00	20.00	2.50	2.40	14.00
Buffalo, N. Y.	3.10	25.00	18.00	2.50	2.05	14.00
Paterson, N. J.	2.40	23.00	20.00	1.75	2.08	17.00
Trenton, N. J.	2.40	26.00	18.00	1.50	2.10	17.50
Scranton, Penn.	2.80	.....	18.00	3.25	.....	.....
Philadelphia, Penn.	2.05	.....	15.50	1.75	2.40	19.75
Harrisburg, Penn.	2.25	.....	19.00	4.20	1.60	20.50
Baltimore, Md.	2.40	.....	13.00	2.00	3.25	15.00
Washington, D. C.	2.25	25.00	14.00	.....	.....	16.00
Richmond, Va.	3.10	31.00	17.50	1.95	2.45	20.00
Fairmount, W. Va.	2.90	35.00	17.00	3.25	3.50	18.00
Winston-Salem, N. C.	2.44	23.50	14.00	2.50	4.50	15.00
Savannah, Ga.	2.25	24.00	20.00	2.00	5.50	16.00
Atlanta, Ga.	2.25	.....	15.00	2.50	3.00	16.50
Louisville, Ky.	2.30	.....	15.50	2.20	2.43	17.00
Shreveport, La.	3.20	.....	22.50	2.00	4.75	24.40
Tampa, Fla.	2.40	.....	20.00	2.10	4.00	19.00
Birmingham, Ala.	2.40	.....	20.00	3.00	.....	16.00
Erie, Penn.	$2.60	$25.00	$17.00	$2.25	.....	$16.00
Canton, Ohio	2.85	.....	16.00	2.50	$3.25	15.00
Toledo, Ohio	.....	22.50	20.00	3.04	2.75	16.00
Columbus, Ohio	2.75	23.00	17.50	2.25	2.50	15.00
Cleveland, Ohio	2.56	22.00	16.00	2.57	2.65	12.50
Youngstown, Ohio	2.95	.....	20.00	3.71	2.75	.....
Saginaw, Mich.	2.80	25.00	20.00	2.80	3.00	20.00
Terre Haute, Ind.	2.75	28.00	18.00	1.65	3.50	17.00
Chicago, Ill.	.....	.....	17.00	1.50	1.90	14.75
Milwaukee, Wis.	2.40	25.00	.....	1.90	1.50	18.00
Lansing, Mich.	2.90	.....	20.00	2.25	2.25	16.00
Des Moines, Iowa	2.66	23.75	20.00	1.60	3.60	.....
St. Louis, Mo.	2.20	.....	18.00	2.70	1.90	17.00
Kansas City, Mo.	2.40	25.00	24.00	1.70	1.87	18.00
St. Paul, Minn.	2.60	25.00	21.00	1.40	2.00	16.00
Sioux City, Iowa	2.80	27.00	26.00	1.50	2.25	16.00
Grand Forks, N. D.	3.00	.....	23.00	2.60	.....	16.00
San Antonio, Tex.	2.82	37.00	20.00	2.10	2.30	18.90
Tucson, Ariz.	.....	.....	30.00	1.75	2.50	.....
Los Angeles, Calif.	2.20	34.00	24.00	2.30	2.05	17.50
Long Beach, Calif.	2.20	.....	26.00	2.16	2.30	14.10
San Francisco, Calif.	2.80	.....	21.00	1.50	1.65	20.00
Seattle, Wash.	2.65	32.50	22.00	1.40	.....	20.00
Portland, Ore.	2.60	27.50	25.00	2.00	1.60	19.00

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Manufacture of Art Objects of Colored Cement

Part III—Tile Inserts Designed to Harmonize with the Metal Background

By George Rice
Palo Alto, Calif.

CEMENT tiles for wall surfaces, borders or furniture inserts can be designed and colored to harmonize with the metal background in which they rest. The handsome tile tables which are the vogue now are good examples of what can be accomplished in design and color when it comes to harmonizing the tile inserts with the ground material. For instance, one manufacturer is making tile tables with a wrought iron base in three styles. The top is genuine tile, decorated in many attractive designs and colors. The

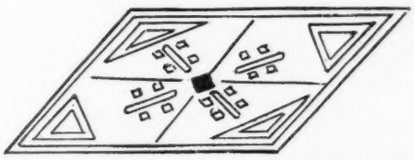


Fig. 1. Cardboard pieces are glued in place on a smooth surface for making the plaster cast

tables are used for serving refreshments, as moisture will not impair the tile or its colors. The method of making these tiles is explained in connection with Figs. 1 and 2. When they are made in wholesale lots for ordinary architectural purposes, the manufacturers commonly subject them to several tons pressure in presses built for the purpose. But when artistic craftsmen make these tile, and work on the principle of giving the customer a distinctive design for whatever purpose the tiles are to be used for, practically equally good pressed effects are obtained by using a backing or a reinforcing cement on the tile. If the tiles are going to be subjected to rather hard service a strong mixture of sand and cement should be used. But for the usual line of tile work for ornamental use, as inserts for box ends, plant boxes, chair backs or table tops, a normal mixture will do. That is, about one part portland cement to two parts fine sand.

Preparing the Design

In the class of tile referred to in this article the design is made in a very simple way. Pieces of cardboard about 1/16-in. in thickness are cut into the various shapes needed for the proposed design. A design which is on paper can be pasted on the cardboard and the particles are severed with shears or the point of a knife by cutting through the edges and lines of the design. This will make all of the parts of the design separate and these separate parts are glued in their original positions in the design upon a smooth glass or metal surface as shown in Fig. 1. The process is much like working out a puzzle in which separate pieces are placed together to form the complete figure.

Next put the retaining bars in position about this prepared model and make a plaster cast from it, because a mold is needed that can stand service, and the cardboard model will do only for a few castings before it will begin to crumble away because of wearing and loosening of the cardboard

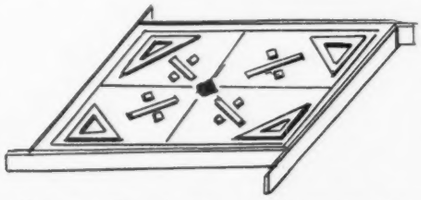


Fig. 2. The plaster cast becomes the model for the cement tile

pieces. But if only one set of tiles are required for a single wrought metal table top or similar use, the carboard model will retain itself in a sufficiently intact state to cast them. Use molding plaster, technically called plaster of paris, for making a model which can be used repeatedly. Make the plaster mix the consistency of molasses by adding water and pour it into the mold, first having greased the cardboard model. After the plaster has hardened the tile thus cast can be lifted out and it becomes the model for

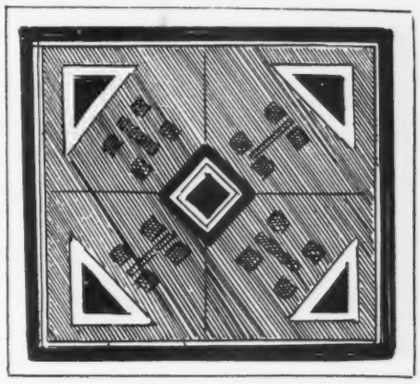


Fig. 3. A sample of finished cement tile

the tiles when a number are to be cast.

Make another mold with this plaster model, using the same retaining bars, and setting them up on a smooth surface as shown in Fig. 2. The casting of any number of plain or colored cement tile as are needed is now possible by applying the usual grease to the form and pouring the cement into it. One of the finished tile is shown in Fig. 3. Various colors can be used.

(To be continued)

More Cement Contracts

THE state of Minnesota closed awards for approximately 1,000,000 bbl. of cement recently for use in 1930 road construction. Placement of the Illinois cement contracts is being held up pending settlement of the gas tax question.

Some Thoughts About Safety

By Loren C. Barton

Vice-President, Riverside Cement Co., Los Angeles, Calif.

MOST OF the mill accidents come from carelessness and if we could get that home to everybody there is no reason in the world why we could not do away with most of them. I have noticed that men working around machinery, and particularly electrical machinery, get careless. They become calloused. They do the same thing day after day without having any mishap occur and they get indifferent to their surroundings.

Loren C. Barton

An accident occurred in our mill several years ago which illustrates this point. Through carelessness or indifference an electrician lost his life. We had a ladder leading up to the wires in the top of the building, and a large and plainly lettered sign at the foot of the ladder directing that no one should go up without first turning off the current. The man who lost his life had been up there many times before and he deliberately walked up the ladder. He reached up to fix something, touched a wire and was gone.

The cause was pure carelessness by one whose experience should have taught him better. And, of course, he violated his instructions as well. Cement mill executives are particularly anxious about these things. They don't want anyone to take a chance.

I have been pained to observe, and others have, the increase which the cement mills are having in fatal accidents. There seems to be no apparent reason why such accidents should increase, but these things seem to go more or less in cycles. We have three or four good years and then we have a bad year, the latter brought on, no doubt, by carelessness.

This subject is an extremely serious one and thoughtful mill men will have it on their minds all of the time. Anyone who is careless and continually careless isn't wanted in our mills and shouldn't be there. We don't want such men in our own organization and other cement manufacturers who pride themselves on the thrift and orderliness of their operations undoubtedly take the same position. We want our men to be careful and will do all we can to help them in their endeavors along that line. Someone has said truthfully and very aptly, "There is no substitute for a careful man."

A man's frame of mind when he goes to work is a very important thing. If he is happy and has a song in his heart, he is interested in his family, those around him and himself and he is more likely to be thoughtful and careful. If he goes to work down at the mouth and discouraged, he is careless and indifferent. I think the women should take more interest in safety work, being very careful to send their men folk to work in a pleasant frame of mind, complimenting good records and criticizing poor ones.

Mill Workmen to Receive Safety Cards and Buttons

THE committee on accident prevention of the Portland Cement Association has just issued the annual "Safe Workers" card and buttons, distributed each year to thousands of cement mill workers who have worked without injury to themselves or others.

Buttons carrying the statement "I Worked Safely During 1929" are finished up in handsome orange and black. Safe workers cards for 1929 are green, while those awarded to employes whose safety record exceeds one year are a golden orange.

The association has already received orders for many thousands of the cards and buttons, indicating that an unusually large number are to be distributed early in January.

Warner Company Employes to Get Free Physical Examination

ARRANGEMENTS are being made by the Warner Co. to extend the privileges of physical examinations to all of its employes, says a recent issue of the *Warner-American News.*

The cost of these examinations will be borne by the company and there will be no expense whatever to the employe.

As soon as this plan becomes effective, all applicants for positions with the company must undergo a doctor's examination before they will be admitted to the Warner organization. This will prevent the assignment of new employes to positions which might eventually undermine their health by accentuating some chronic weakness.

Virtually the same examination is to be extended to the present personnel of the company sometime in the near future.

The physicians who will do the examining have not as yet been selected nor has the form of the examination been definitely decided. But it will be practically the same as that given when application is made for life insurance.

Cement Section Now Issues News Letter

THE Cement Section of the National Safety Council has just issued the first issue of a monthly "News Letter" edited by Jack Dempster, live-wire safety chairman of the Canada Cement Co., Ltd., at Port Colborne, Ont. The News-Letter is being mimeographed and mailed to all plants represented within the Cement Section membership.

Mr. Dempster has originated a large correspondence with superintendents and safety committees with a view to securing an interchange of live ideas that will be helpful in stimulating interest. Unpretentious personal items, rather than "papers," is what is wanted.

White Cement to Be Made at Vicksburg Mill

WHITE cement as well as the usual gray portland cement will be made at the new Vicksburg, Miss., plant of the National Portland Cement Co., according to A. K. Kutner, assistant general manager of the company. The National company is projecting the new mill, the first in the state of Mississippi and the second of the company, the other plant being located at Chubbuck, Calif. (See ROCK PRODUCTS, October 26.) Raw material for white cement manufacture will be shipped from California, the company owning large reserves of feldspar in that state.

In conjunction with this announcement the National company states that L. J. Folse has been elected secretary and treasurer of the company. Mr. Folse has been general manager of the Mississippi state board of development since August 1, 1922. He is a director in the Mississippi Valley Association and chairman of the Mississippi division of the Southern States Reclamation Association.

Indiana Sand and Gravel Producers Hold Annual Meeting

THE ANNUAL meeting of the Indiana Sand and Gravel Association was held at Indianapolis, Ind., in the Claypool hotel on Friday, December 6, 1929. The meeting followed that of the road contractors' association held the previous day so that a larger attendance, by this agreement, was anticipated as many of the sand and gravel producers were expected to attend both meetings.

The day previous to the main session the executives and directors held their meeting at the Lincoln Hotel. This meeting was carried over to the following day and delayed somewhat the main proceedings, so that by the time the meeting did start the expected address of the president, Harry Nattkemper, was not delivered, although Mr. Nattkemper did take the time to express his appreciation of the good work that was being done by the association under the direction of the executive secretary, S. C. Hadden, and a desire for a continuation of the association's activities.

Mr. Hadden then gave his report in which be outlined what had been accomplished during 1929, calling particular attention to the increase in the gasoline tax which will increase the state highway department's revenues some $4,000,000 per year.

About $21,000,000 Available for Highways in 1930

It will be recalled that the gasoline tax was increased from 3 cents to 4 cents per gallon during 1929. Under the 3 cent tax $9,000,000 per year would have been realized and the increase will give $12,000,000 to $13,000,000 to the highway fund alone for 1930. Other highway income, including auto license fees and federal aid, will bring the total to about $21,000,000. It was largely through the association's activities and the co-operative efforts of its members that the increased gas tax law was passed.

Sensing the fact that unless proper precautions are taken in the handling and expending of such a fund there is apt to be a diversion of highway funds for other purposes (one state diverted highway funds for school purposes), the association was instrumental in getting the Indiana Highway Commission to outline and publish their comprehensive plan of highway construction that will by the time it is completed involve the paving of 2000 miles of state highways over a period of several years.

Fight Attempt to Divert Road Funds

Prior to this new policy, the highway commission did not divulge its plans to any extent, mainly for the reason that it did not want to be annoyed by interests lobbying for any particular section. The association felt that if the public was brought to realize that the commission did have a definite goal at which it was aiming there would be less likelihood of other factions asking for a diversion of highway funds for other purposes.

The secretary also pointed out that the highway commission had allotted the new highways to appease local political factions and at the same time to serve a useful and needed purpose, particularly in Marion county (including Indianapolis), where very little highway work had been done recently, but a county that is naturally, politically, one of the strongest in the state. In Marion county the Belt Line Highway, discussed for some time past, will be constructed at an early date as a part of this plan.

Plant Inspection of Material

Mr. Hadden spoke of a second important accomplishment of the association, namely, that of securing plant inspection for sand and gravel producers. Apparently, and this was further emphasized in the discussions that followed, plant inspections had in many instances been more or less of a boomerang, because of a lack of understanding between the producers and the state highway department. Blame was not placed entirely on the shoulders of the inexperienced plant inspectors, but at the top where it belonged. It was felt that this was one problem that would adjust itself when the producer and inspection service had thrashed out their own individual differences, and that as a whole plant inspection was desirable and economically sound.

Endorse Hoover Program

In closing his report, Mr. Hadden called attention to President Hoover's program for public works, etc., and asked the members to personally interview their county representatives to find out what they intended to do in regard to the President's plans for increased construction activities during 1930, so that while public sentiment was favorable, needs of the communities could be secured by prompt legislative action.

It was apparent, after hearing Mr. Hadden discuss Indiana sand and gravel problems that he had an unusual and broad knowledge of the work a producer's association might and should do to further their interests as well as the public's. He has a grasp of the internal political situation in Indiana and knows how to use this knowledge to his association's advantage.

At the close of the secretary's report, the meeting adjourned for luncheon, which was sponsored by the Cincinnati Rubber Co.

The afternoon session opened with the president asking each producer present for any remarks on problems confronting the industry. Practically all who did talk confined their remarks to Mr. Hadden's report; mainly to an expression of hearty approval of what had been done during 1929.

New Officers

The following officers were elected: W. H. Sanders, president; Earl Baker, vice-president, and Charles Connelly, secretary-treasurer. The following directors were also elected: First district, Charles Purdam; second district, E. G. Sutton; fourth district, Lee Witty. The retiring officers were Harry Nattkemper, president; Jesse Shearer, secretary-treasurer, and K. R. Misner, director from the third district.

After the election of officers, R. C. Yeoman, assistant to the president of the Construction Materials Co., Chicago, Ill., and former secretary of the Indiana association, gave a talk briefly outlining conditions in the Chicago territory in which he mentioned the large volume of business transacted there under extreme competitive conditions necessitating operations on a large scale and embodying the latest engineering design, so as to be able to produce any size of commercial material at low costs. Mr. Yeoman called attention to the construction by his company of a 30-in. suction dredge and a new screening plant in the Chicago district. This plant will be able to produce 2,000,000 tons of sand and gravel per year with facilities for shipment by water or by rail. All present were invited to inspect these new operations.

The following producers were present:

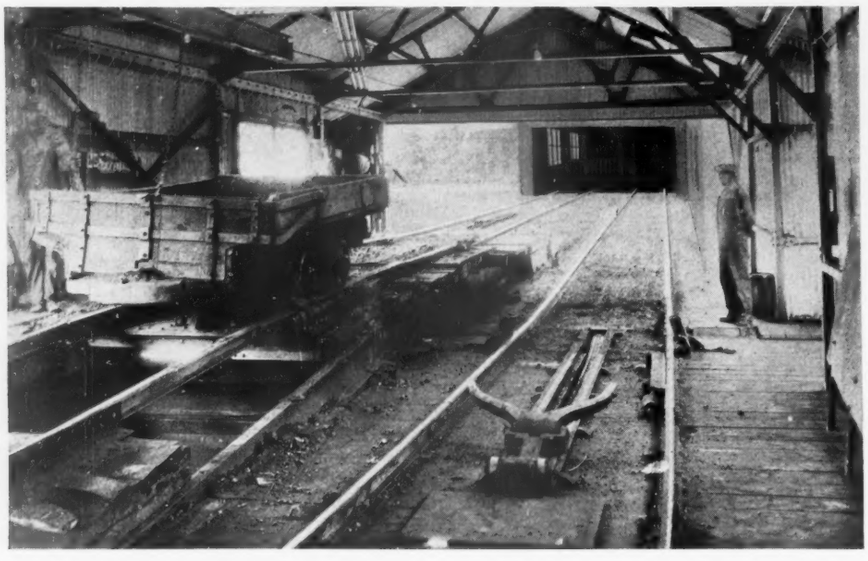
Registration

Frank Billiter, Indiana Gravel Company, Indianapolis; Earl Baker, Baker Gravel Company, Noblesville; John P. Cantlon, Neal Gravel Company, Mattoon; Chas. Connelly, Terre Haute Gravel Company, Terre Haute; H. C. Huffstetter, Brown-Huffstetter Sand Co., Indianapolis; Abe Hart, Sandborn Gravel Co., Sandborn; L. F. Hart, Wabash Sand and Gravel Co., Terre Haute; Arthur Lacey, Indiana Gravel Co., Indianapolis; W. B. Lenhart, Rock Products, Chicago, Ill.; Howard Maxwell, Maxwell Gravel Co., Indianapolis; Floyd and Frank Million, Million Sand and Gravel Co., Lake Cicott; K. R. Misner, Western Indiana Gravel Co., Lafayette; Herman and Ben Neal, Neal Gravel Co., Mattoon, Ill.; Geo. J. Nattkemper, Terre Haute Gravel Co., Terre Haute; M. A. Neville, Western Indiana Gravel Co., Lafayette; Lawrence O'Donnell, O'Donnell Sand and Gravel Co., Vincennes; Charles Purdum, Sturm and Dillard Co., Syracuse; Jesse A. Shearer, Indiana Gravel Co., Indianapolis; H. L. Smith, Kirkpatrick Gravel Co., Cambridge City; Ben Stone, Merom Gravel Co., Indianapolis; E. Guy Sutton, Neal Gravel Co., Mattoon, Ill.; W. H. Sanders, Western Indiana Gravel Co., Lafayette; Ed Theobald, Anderson-Theobald Co., Vincennes; Arthur Wilson, Indiana Gravel Co., Indianapolis; Lee Witty, Wabash Sand and Gravel Co., Terre Haute; R. C. Yeoman, Construction Materials Co., Chicago, Ill.; Harry and Howard Hoffman, Magic City Supply Co., Muncie.

New Machinery and Equipment

Electric Reciprocating Car Feeders

AN electric feeder for delivering cars to the car dumper is announced by Roberts and Schaefer Co., Chicago, Ill. The device has but one carriage in which there is a forked or duck hook, designed especially for the car, which engages the axles near the bearing wherever there is the least tendency to bend the axles. Or it engages the bearings themselves, or engages the ends of cars, depending on the type of car used. This dog is held up by a positive spring action, insuring its engagement of the cars at all times, though it permits the passage of the locomotive over it. The carriage has a long wheel base to distribute the eccentric pull, and extra guide wheels to prevent the bending of the guides. The load is picked up against a powerful spring cushion.



Electric feeder for delivering cars to the dumper. The device is shown installed on the track at the right

The whole unit is of rugged construction. The carriage runs forward and back on I-beam guides mounted on cast steel supports. There are no guides required for the return strand or lower strand of chain. The chain used is a short pitch, permitting the use of small sprocket wheels which require little excavation and a simple supporting structure. The drive unit consists of a motor, speed reducer and brake.

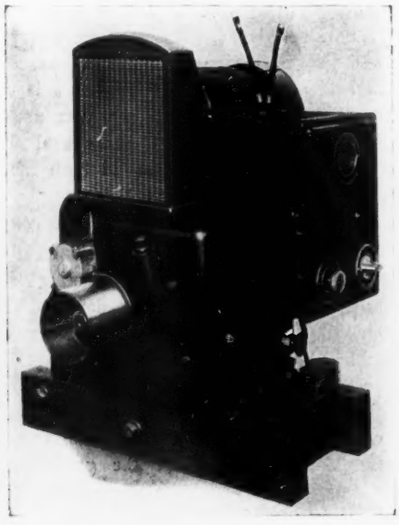
Operation is simple; by pushing a control button the carriage travels forward whatever distance the stroke is set for, automatically reverses and returns to its starting position and stops. Emergency buttons are provided so that the carriage may be reversed at any point of the forward stroke or stopped, as desired. Operating the car feeder by remote control from any position is possible as required. In the illustration below, the dump operator controls the operation of the car feeder.

For service as a trip-maker this electric reciprocating car feeder is started by a switch operated by the car itself as it comes off the kickback and the whole train is advanced one car length on the arrival of each car from the kickback.

Some of the advantages claimed for the car feeder are: No lugs required on the car; no bending of axles; absolute control of trip at all times; adjustable length of stroke for varying weather conditions and friction of cars; fewer moving parts, less upkeep; lower installation cost; design permits heavier construction.

Lighting Plant for Auxiliary Service

AS A dependable source of power to supply illumination for night work, Fairbanks-Morse and Co., Chicago, has developed a compact self-contained light plant. Particularly is this unit claimed to be adaptable for use on cranes, dredges and excavating equipment to supply the adequate illumination that is required on jobs which necessitates 24 hr. a day operation. An independent lighting unit is advisable because it provides a steady candle power and also is available for use when the main power plant of the dredge or similar piece of equipment is not in operation. The plant can be used to provide light at such times as the boat is at anchor.



Auxiliary lighting plant

The plant comes in two sizes of 750 and 1500 watts capacity respectively. In the assembly the power unit, the ignition system, the generator end and the control mechanism are maintained as separate units not being tied up in any way that introduces complication. The engine used is the Fairbanks-Morse self oiling "Z" engine with high tension magneto ignition. The smaller 1½-hp. unit is designed to operate on gasoline as fuel, while the larger 3-hp. engine can use either gasoline or kerosene. The generator is a ball-bearing machine mounted as a unit directly above the engine.

While this plant is built in two sizes, it is offered with a variety of storage battery combinations which will meet almost any demand placed on the unit for either a 32-v. or standard 115-v. circuit. Either size can also be furnished for direct lighting when it is desired to operate without the storage battery.

Caterpillar Tractor Cuts Prices

FOR THE SIXTH TIME in the last four years Caterpillar Tractor Co., San Leandro, Calif., has reduced prices of its products because of large sales volume making possible increased production. The new prices effective today on farm machinery, road building, logging and construction units range in reductions of $520 to $25. The largest reduction is on the 20-ft. combine, while the five models of tractors are reduced from $125 to $25.

President Smith of the P. C. A. Comments on Business Conditions

FRANK H. SMITH, president of the Portland Cement Association and state commissioner of banking and insurance in New Jersey, who was one of the 18 men called into conference by President Hoover for the purpose of finding out just how white the national building construction industry had been bled during the recent reign of stock speculation, tells his impressions of building prospects in general through Allen E. Beals in the current *Dow Service Daily Building Reports.*

Answering the question as to what had occurred to make it necessary for the President of the United States to rally the heads of industry in peace time as they had been rallied in war time, Mr. Smith said:

Building Conditions Sound

"The situation is not anything like what it was in war time. Then there was no visible outlet. The whole range of post-war readjustment stood before the nation and the world. There was a shortage of labor, whereas today this factor does not exist. Rampant stock market speculation, over a long period of time, naturally drains money from building construction channels. That money is beginning to flow back, but it seemed to me that the President felt it would flow back quicker if investors could be made to see that fundamental building conditions are sound.

"There is nothing fundamentally wrong with the building construction industry, nor with business as a whole.

"This belief was unanimous. The President was told that there would be no disposition to arbitrarily raise prices if wages were not increased above the 1929 standards.

"The long continued flow of building construction money away from investment and toward speculation has made building construction a sluggish industry in some parts of the country. In other words, the long rest period has enabled tenancy to catch up with surplus housing supply, but the President seems to have definite ideas as to what he wants to accomplish and that is, to stimulate construction and business generally, everywhere, probably because it has been the industry that has suffered the most from stock market speculation and because it is the industry from which the quickest response can be expected.

"The conference at the White House was a preliminary one. Out of it will flow various organization committees within the industry and their recommendations will be made directly to the President.

"As money rates have fallen, progress in the direction of greater building construction activity has been seen and felt. Indeed, I am informed that in New York City and other large sections, the changed condition in building construction finance has brought about the revival of plans that have long lain dormant. This has been noticed in the greater stability of prices and, where actual price changes have not yet taken place, there is at least a halt in their further downward course. This movement spreading over housing, industrial and other types of building projects, municipal improvements, the release of great engineering works, highway improvement and institutional building construction by national, state and municipal authorities—all distinctly accelerated with a patriotic desire to help the President maintain general prosperity throughout the country—is already being felt in New York.

"It has been noticeable in this way, for example. Inquiries are coming in from various points as to what the condition is with regard to building material supply.

The Cement Mill Situation

"Speaking for the cement industry, 1929 will show a slight decrease from the volume reported in 1928 and up to recently it looked as though there was going to be a still lower volume for 1930. All cement mills are running on reduced schedules. For example, our member mills produced 148,711,000 bbl. in the first 10 months of 1928 and only 144,896,000 in the same period in 1929. In the first 10 months of last year 156,120,000 bbl. were shipped as against 152,240,000 bbl. in the same time this year. As to stocks on hand, at the end of October in 1928 we had 14,579,000 bbl., whereas this year we have 15,361,000 bbl.

"There is no contemplation in the cement industry looking toward the reduction of wages. Neither do I look for any. There has been some reduction in hours of employment so as to let as many benefits as possible, where working hours have been curtailed. There is plenty of mill capacity available so there need be no fear of a shortage of cement supply. Plant capacity that is able to turn out 250,000,000 bbl. a year is only operating at an economic maximum of 175,000,000 bbl., and the foreign situation, especially along our seaboards, is directly responsible for that, for the tonnage is kept down by price, and our largest markets lie adjacent to our coast lines.

New Era in Building

"A new era is at hand for building. The construction outlook is better today than it has been for the last few years and, in addition, the great power of the United States is behind the industry, leading the way with its own vast building construction program. So far as I can remember, so great a rally for peace time construction has never been attempted. The problem of today is to keep prosperity with us, and that, I believe, is what the President intends to do."

Arkansas Asks Bids on 300,000 Tons of Aggregate

THE Arkansas Highway Commission recently received bids on approximately 300,000 tons of gravel, crushed stone and sand to be assembled in stock piles in various parts of the state before road construction is resumed on a large scale in the spring. Bids were submitted by 27 firms, some of them bidding on a half dozen or more concentration points within reach of their plants. Proposals were based on f. o. b. prices at the plant, to which must be added freight costs.

Bidders were: Crow Creek Gravel Co., Forrest City; Malvern Gravel Co., Malvern; Lutesville Sand and Gravel Co., Lutesville, Mo.; Big Rock Stone and Construction Co., Little Rock; Arkadelphia Sand and Gravel Co., Arkadelphia; Fischer Lime and Cement Co., Memphis; Pine Bluff Sand and Gravel Co., Pine Bluff; Wright Lumber and Material Co.. Doniphan, Mo.; Merriwether Sand and Gravel Co., Lewisville; Batesville Sand and Gravel Co., Batesville; Standard Sand and Gravel Co., Antoine; Arkola Sand and Gravel Co., Fort Smith; Missouri Portland Cement Co., Memphis; Red River Stone Co., Searcy; S. E. Evans Stone Co., Fort Smith.—*Little Rock* (Ark.) *Gazette.*

Texas Cement Shipments Decline Sharply in November

DURING November, the output of cement in Texas declined 15%, as compared with October. Ordinarily a decrease of 6 to 8% occurs between the two months, so that curtailment this year is much greater than usual. Moreover, the normal trend in output is downward until next March.

During November, 661,000 bbl. were turned out at Texas mills, compared with 777,000 bbl. in October and 529,000 bbl. in November, 1928. It should be noted that two more plants are operating this year than last. Shipments fell from 743,000 bbl. in October to 523,000 bbl. in November—an unusually large decline. Last year in November, 451,000 bbl. were loaded. Stocks amounted to 665,000 bbl. on December 1, whereas but 424,000 bbl. were reported on the corresponding date of 1928. The sharp decline in shipments, coupled with the accumulation of stocks, indicates a falling off in demand.

No change was made in prices. The basic price on December 1 was $2.15 per bbl. at Dallas and $2.25 per bbl. in Houston. Ten cents per bbl. discount is allowed for cash and 40 cents for cloth sacks where returnable.

News of All the Industry

Incorporations

New York Stone Co., Bloomington, Ind., filed petition for dissolution.

Eastern Sand and Gravel Corp., Devon, Penn., $5000.

Robins Portland Cement Holding Co., 1940 East Davison Ave., Detroit, Mich., $5000.

San Antonio Building Materials Co., San Antonio, Tex., is reclassifying its shares.

Olean Gravel Corp., Olean, N. Y., 1000 shares common.

International Phosphate Corp., Tallahassee, Fla. G. G. Crawford, 601 N. Duval St., Tallahassee.

Powell Lime and Cement Co., Memphis, Tenn., increased capital stock to $50,000. J. L. Powell, president, and R. L. Pemberton, vice-president.

Kammerer Concrete Products Co., El Paso, Tex., $50,000. Mathias Kammerer, John M. and Joseph A. Kammerer.

Hawley Quarry and Construction Co., Chattanooga, Tenn., $1000. J. R. Dickson, Mattie H. Dickson and Minnie Lee Hawley.

Dudley Black Quarry Co., Gleason, Wis., changed name to Dudley Granite Co. and increased capital stock from $35,000 to $50,000.

Utah Gypsum Products Co., Levan, Utah, filed application for 100,000 shares common, 25c per share.

Southern Indiana Lime and Mineral Corp., Corydon, Ind., 10,000 shares no par value. To quarry limestone and other products. Wm. Buchanan, Joseph H. Kraft and D. M. Hastings.

Up Town Coal and Coke Co., Chicago, Ill., changed name to Central Lime and Cement Co. Correspondent: T. J. Sullivan, Reich Bldg., Springfield, Ill.

Hodgkin-Adams Co., a Kentucky quarry corporation, incorporated to do business in Indiana; capital stock, 500 shares. Herman Adams, Osgood, Ind., agent for Indiana.

Acme Gravel and Construction Co., Inc., Indianapolis, Ind., 500 shares. To produce sand and gravel and other building materials. Jesse L. Alley, Florence H. Alley, Herbert L. Alley and Robert B. Alley.

Betta Lime Corp., Brooklyn, N. Y., 100 shares common. C. F. Greenberg, 50 Court St., Brooklyn.

Hardy Sand and Gravel Co., Millersburg, Ohio, $15,000 and 250 shares no par value. Robert B. Putnam, Catherine Blanch Killian and Florence M. Drushell.

Quarries

Douds Stone Quarry has opened a new quarry adjacent to the Rock Island railroad near Douds, Iowa, and is now mining from this quarry.

Ft. Collins, Colo. The old quarry near here which supplied stone for the Union Pacific railroad's station at Cheyenne, Wyo., has been reopened to obtain matching stone for enlargement of the building.

Cardington, Ohio. Test drilling on the J. Click farm, southeast of here, revealed good limestone 12 ft. below the surface of the earth, and if further investigation warrants it a quarry will be opened here to supply stone for the Cardington East road to be built next spring.

Calavera Rock Co., Carlsbad, Calif., is planning a huge blast of between 6000 and 7000 tons of dynamite at its quarry. The character of the rock in this section is such that ordinary means of quarrying are not sufficient, and the blast planned is expected to make available hundreds of thousands of tons of material.

National Lime and Stone Co., Bucyrus, Ohio, has been awarded contract to furnish 100,000 tons of crushed limestone for the new Ohio division yards of the New York Central lines near Moline, Ohio. Delivery of the entire amount of stone must be made within 90 days and a force of 30 men has been employed at the quarries.

The M. Cummins Stone Co., St. Louis, Mo., has leased a stone quarry located one mile north of Columbia, Mo., from C. H. Taylor, Columbia. J. A. Cummins, who is associated with his father and two brothers in the company, and who will have charge of the Columbia quarry, reports that $14,000 worth of equipment is being shipped from St. Louis for the plant.

The Eureka Marble Quarry, Marble Valley, Ala., which has not been operating for a number of years, is completing plant additions and installation of new machinery and will again be in operation very soon, according to H. H. McClellan, its owner. A crushing plant for crushing the stone to various grades adjoins the quarry, and the L. & N. railroad's line to the quarry affords easy transporting of the material.

Sand and Gravel

Brown-Rosenbarger Gravel Co., with plants at Goshen, La Grange and Muncie, Ind., has opened sales offices at 1129 Peoples Bank Bldg., Indianapolis, Ind.

Laval Sand Co., Hinton, W. Va., which applied for permission to dredge sand from the Big Sandy river, as reported in December 7 ROCK PRODUCTS, has been granted permit.

Pine Bluff Sand and Gravel Co., Pine Bluff, Ark., has acquired the Arkansas Sand and Material Co.'s plant, northeast of Pine Bluff on the Arkansas river, valued at approximately $50,000.

Piggott Gravel Co., Piggott, Ark., recently received an order from Missouri to supply the gravel for several miles of roads from Brown's Ferry bridge into Holcomb, Mo.

Iowa. The state highway commission has opened bids on 278,200 tons of sand and 408,100 tons of gravel or crushed stone to be used on paving highways 32 and 7.

Grand Rapids Gravel Co., Grand Rapids, Mich., recently purchased four Federal Big Six dump trucks for delivering gravel. In addition to the number of trucks that the company owns they employ approximately 30 others.

Watauga Sand and Gravel Corp., Elizabethton, Tenn., has taken an option on 75 acres of land at the end of the Main St. bridge, Elizabethton, and will operate a sand and gravel plant here. The corporation is composed of East Tennessee business men.

Lyman-Richey Sand and Gravel Co.'s plant at Newark, Neb., is working on a 7-day, 24-hr.-per-day schedule, filling orders. About 35 cars per day are being loaded and shipped to Kansas and Missouri points. Orders booked are expected to keep the plant in operation the entire winter if weather permits.

Pioneer Sand and Gravel Co., Seattle, Wash., will shortly install a new Symons cone crusher at its Steilacoom, Wash., plant. The machine will have a capacity output of 170 tons an hour. This is the second crusher of this type to be installed by the company.

Memphis, Tenn. Acting on the petition of two creditors whose claims aggregate $10,000, a general creditors' bill was filed recently in chancery court against the Raleigh Sand and Gravel Co., for which it was asked that a receiver be appointed. Debts of the company are listed as approximately $25,000; assets are not scheduled.

Waupaca Sand and Gravel Co., operating a pit at Lake Emily, Wis., owned by Portage county, has offered a new contract to the county to succeed the old one expiring in April, 1930. The present royalty of 5 cents per ton paid the county will be lessened under the terms offered in the new contract.

Cement

Dewey Portland Cement Co., Davenport, Iowa, held its annual sales meeting recently at the company's plant near Buffalo, Iowa. As part of the program a banquet was given at the Hotel Blackhawk, Davenport, and the speakers were F. E. Tyler of Kansas City, president of the company; H. F. Tyler, first vice-president, and K. P. Ferrell, technical service manager. The meeting was in charge of L. J. Capen, vice-president and sales manager.

Lime

Manchester Lime Co., Manchester, Tenn., has plans for a two-story storage and distributing plant to cost about $40,000, with mechanical-handling and other equipment. P. A. Stiver is in charge.

Arkansas Lime Products Co. is making tests of lime rock deposits near Washington, Ark. An official of the company is expected to arrive here soon to inspect the deposits, which it is said look very favorable.

Cement Products

Peerless Artificial Stone Co., Rhodes Ave., Toronto, Ont., Canada, is receiving bids for a factory to cost $20,000.

Readymix Concrete Co., 575 Berry St., San Francisco, Calif., has revised plans for new plant to cost $100,000 with equipment. L. H. Nishkian, 525 Market St., San Francisco, is the engineer.

A. C. Ochs Brick and Tile Co., Springfield, Minn., is furnishing the brick for a six-story building which is being erected at the State Fair grounds at Hamline, Minn., to be used for storage purposes.

Miscellaneous Rock Products

Southern Phosphate Co., subsidiary of the Davison Chemical Co., Garrett Bldg., Baltimore, Md., is erecting a rock drying plant at Bartow, Fla. Nashville Bridge Co., Nashville, Tenn., has contract for the structural steel.

Spokane Magnesite Sales Co., Spokane, Wash., has purchased the mixing plant of the Spokane Concrete Pipe Co. The plant, which is the only one of its kind in the Intermountain territory, has been occupied by the magnesite company on lease since its organization in September, 1928. Henry Hostetler is president and T. Grant Ware vice-president and treasurer.

Personals

Chas. Piez, chairman of the board, Link-Belt Co., Chicago, began his term as president of the American Society of Mechanical Engineers at the recent annual meeting held in New York City.

Tom M. Girdler, president of the Jones and Laughlin Steel Corp., has resigned to become associated with the Otis and Co.-Eaton-Mather steel interests of Cleveland, Ohio.

E. B. Nichols, at one time chief engineer of the Victor Talking Machine Co., and more recently associated with the Bell Telephone Laboratories, is now chief engineer of the Brown Instrument Co., Philadelphia, Penn. Mr. Nichols will act in an administrative capacity, supervising the work of the engineering staff.

George White, who has been with the National Cement Co., Birmingham, Ala., for the past four years, has resigned, effective January 1, to become manager of promotion and sales for the West Construction Co. and allied companies of Chattanooga.

J. M. Dannelly, Jr., has been appointed acting sales manager of the cement company. He has been with the company for the past two years, first as sales representative in South Alabama and then as a special representative.

Kenneth E. Casparis, long connected with the quarry industry, is now with John Gunn and Sons, Ltd., engineers and contractors of Winnipeg, Man. Mr. Casparis is engaged in designing and erecting a 1600-cu. yd. per day crushing plant for the Gunn company's hydro-electric project at Slave Falls on the Winnipeg river. In connection with the project a central concrete mixing plant using bulk cement will be installed. Just recently Mr. Casparis completed engineering services with the Winnipeg Electric Co., Ltd., at its Seven Sisters hydro-electric project. This company plans to install a large crushing plant for the reduction of 1,100,000 tons of tail race rock.

Obituaries

Elmer Noble, 57, superintendent of the Universal Portland Cement plant at Whiting, Ind., dropped dead of heart disease while shoveling snow outside his home on December 18.

H. W. Goode, 44, superintendent of the shale quarry of the Southwestern Portland Cement Co., died at his home in Zanesville, Ohio, of heart trouble.

John McIntosh, president and managing director of the Stanstead Granite Quarries, Ltd., passed away at his home recently, following a short illness with pneumonia. Mr. McIntosh was in his 74th year.

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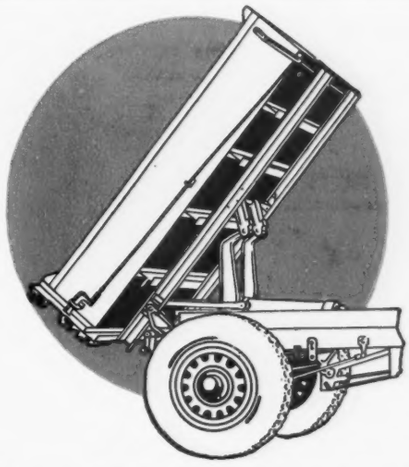

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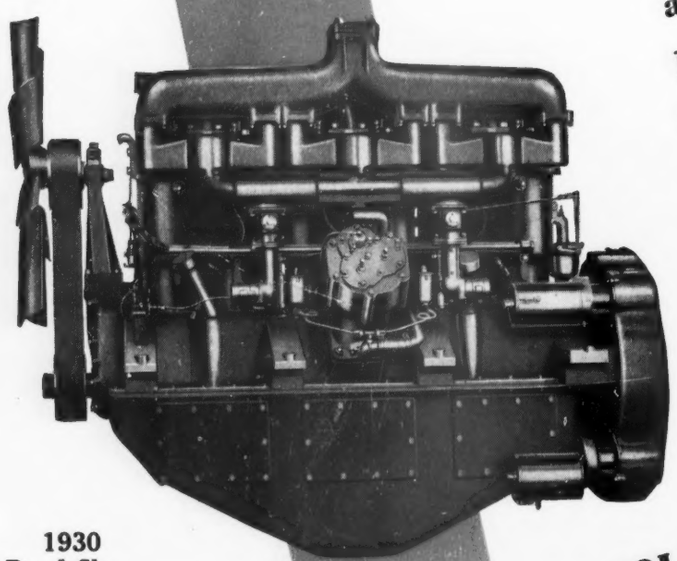

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